PUBLIC SWITCHED TELEPHONE NETWORK (PSTN)

Volume I

The PSTN Set of Rules (PSTN SR) contains two volumes.

Volume 1 - SR on Public Automatic Telephone communication.
Volume 2 - SR on the future norms on the PSTN channels.

The present volume (book 1) is the product of the detalization and study of the previous edition of the PSTN SR ("Radio & Svyaz", 1982).

The detalization of the SR was done on the basis of the system analysis of the requirements to the new semielec-tronic and electronic switching devices, summary of the net-work maintenance experience with the consideration of the mo-difications and detalization of the main rules of the Unified.

Automatic Telecommunication System (UATS), which were appro-ved by the Interministerial committee on the 30th of March 1982 and 2nd of March 1984.

Detailed SR if compared with the previous version contains the following additional materials:

- transmitted messages characteristics;
- tarification, charging and billing system;
- software structure;
- software development and trunks calculation.

This SR should be used by research and development organizations in development of the switches and nodes of the telephone network, by the network planning organizations during the development of the project and automatization plans, by the Ministry of Communication departments for the development of the telephone networks by the different organizations to interface their private networks with the PSTN.

PURPOSE OF SYSTEM

1.1. PSTN is needed to meet the requirements of the individuals, organizations and offices to transmit telephone messages all over the country. It should also provide access to the international network.

System should provide interconnection with the private networks and exchanges having access to the PSTN, complying with the requirements of the present document.

When the corresponding terminal equipment is used, the PSTN should support the data transmission, facsimile transmission, E-mail and other messages with the crosspoint switching.

1.2. System should provide connection of any given subscriber with any other one all over the country using either automatic or semiautomatic method.

Automatic method is used to provide handling of the calls from the residential, hotel or enterprise subscribers as well as from pay-phones.

Semiautomatic method should provide conversations accompanied by several additional services (notification, inquiry, call to the defined person) and calls from the special pay-phone centres etc.

2. DESCRIPTION OF TRANSMITTED MESSAGES

2.1. The PSTN provides to subscribers the possibility of real time message transmission in the dialogue mode of operation.

2.2. The telephone messages should be transmitted via the PSTN with the grade of service that ensures the legibility and accuracy of the initial signals reproduction.

Grade of service indicators should correspond to the norms, recommended by the CCITT and documents approved by the Interministerial Committee.

2.3. PSTN telephone network have to ensure the data transmission with the speed up to the 1200 bit/s. The data transmission speed may be increased by agreement with the USSR Ministry of Communication.

2.4. Total (outgoing and incoming) traffic from the subscriber terminal in busy hour when transmission and reception of data, telephone E-mail and etc messages should be, on an average, no more than 0.1 Erl and should not exceed 0.15 Erl.

The power level during the transmission should not exceed the values stated in the normative documents approved by the Interministerial Committee.

3. ARCHITECTURAL PRINCIPLES OF PSTN

3.1. The Public Switched Telephone Network consists of the local and toll automatic exchanges, switching nodes, lines and channels of telephone network and subscriber telephone terminals.

It is possible to use voice-frequency channels and digital channels of various transmission systems (cable, microwave, satellite) as channels of the Telephone Network. It is possible to use metallic circuits, voice frequency channels and channels of digital transmission system as lines of Telephone Network. Development of the PSTN should be carried out in accordance with the stages of Unified Automatic Telecommunication System development.

3.2. PSTN consists of:

- zonal telephone network;
- toll telephone network.

3.3. ARCHITECTURAL PRINCIPLES OF THE ZONAL TELEPHONE NETWORKS

3.3.1. Zone - is a part of the country territory where all subscribers of the Telephone Network have one unified 7-digit numbering plan. Zone boundaries depend on the maximum number of inhabitants and number of telephone-sets as well as the administrative divisions of district (land, republic). On determination of the zone boundaries it is necessary to take into consideration the following factors:

- nominal (theoretical) capacity of the local telephone network should not exceeds 8 mln. subscriber numbers within the 50 years perspective. It is also necessary to foresee the reserve, with taking into account the rate of the numbering plan use and unforeseen circumstances;
- the destination of the major part of the network traffic should be within the same zone;
- zone, as a rule, should include the territory of administrative district; several zones may be organized at the territory of one district if it is feasible. Separate numbering zones are organized in the Union Republics which are not devided into regions and districts. Zones are organized by toll exchange installation.

3.3.2. Zonal telephone network consists of:

- local telephone network, situated within the zone;
- intrazonal telephone network.

There are different types of Local Telephone Networks;

- urban telephone network;
- rural telephone network;
- combined telephone network.

3.4. URBAN TELEPHONE NETWORK ARCHITECTURAL PRINCIPLES

3.4.1. On the second stage of development urban telephone networks should be designed with the use of switching equipment of step-by-step, crossbar, quasi-electronic and electronic systems.

3.4.2. Subscriber terminal devices should be connected to the switching equipment of the urban telephone network via two-wire interface, according to the following (Fig.3.1.):

- directly, into Central Office by the individual extension lines some of which are common for several subscribers (shared telephone-set);
- into PBXs, which are connected to the CO's of urban network via trunk groups;

into remote switch (concentrator), connected to the CO;

The selection of the way of subscriber terminals connection into UTN should be is feasible and should depend on the possibilities of existing switching equipment, the possibility of installation of the remote switches in denlity populated areas, technical peculiarities of the primary subscriber line network (the extent of the multi-channel transmission equipment use on this network) etc.

3.4.3. The following versions of urban telephone network structure are foreseen, with taking into account the possibilities of existing switching equipment and one to be designed.

a) nondistrictive telephone networks;

b) districtive telephone networks without tandems (Fig.2.3), which have several CO's, connected one to another via trunk groups using the principle "each with each";

c) districtive telephone networks with incoming tandems (Fig.3.3), that contain several tandem districts; CO's of one tandem district may be connected one to another according to the principle "each with each" (tandem district 1) or may be connected via incoming traffic tandem of it's own tandem district (tandem district 2), moreover, cross-bar, quasi-electronic and electronic exchanges allow the existance of the two above mentioned versions of intratandem interoffice types of communication at the same time; CO's of one tandem district are connected with the CO's of the other tandem districts via the incoming tandems of these other districts. It is possible to organize routes from cross-bar, quasi-electronic and electronic CO to the CO's of other tandem districts, passing over corresponding incoming tandems (dotted line, Fig.3.3);

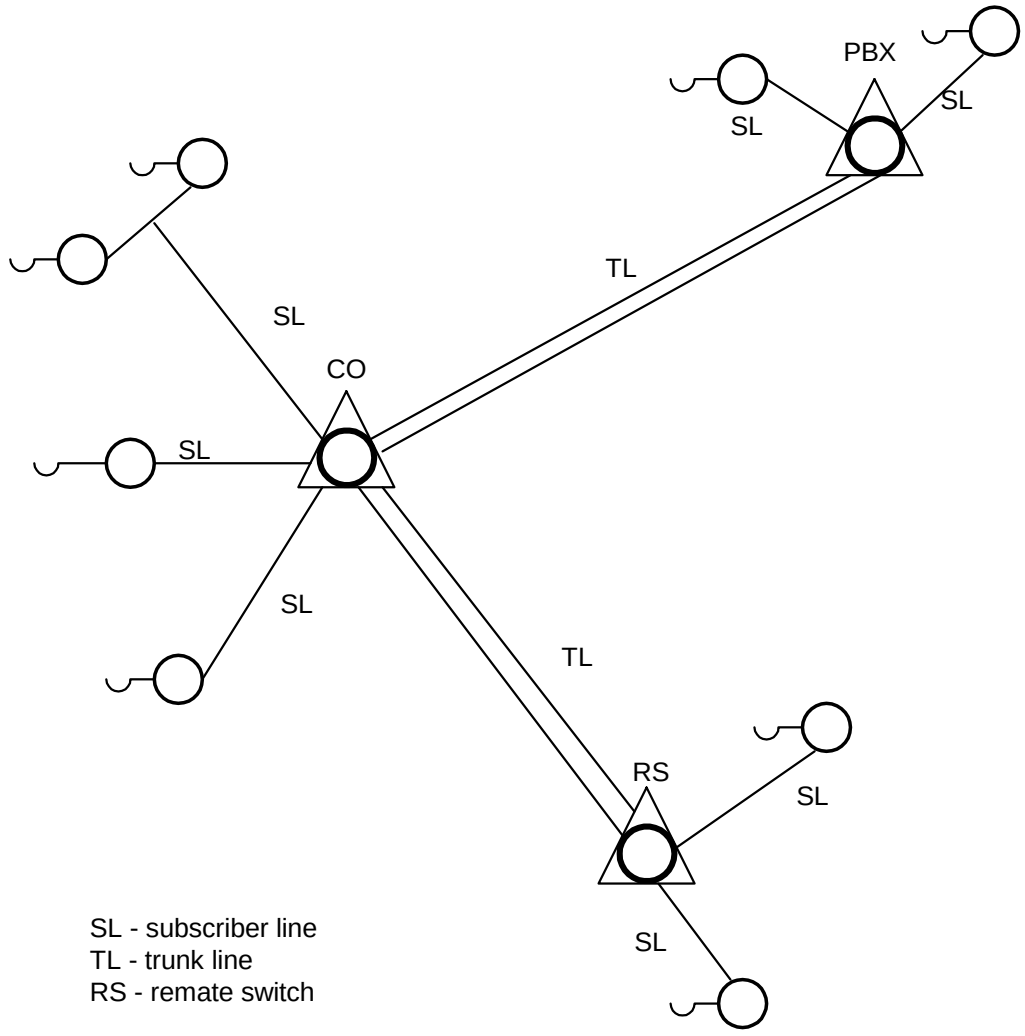


Fig. 3.1. Connection of subscriber terminals to the UTN switching equipment

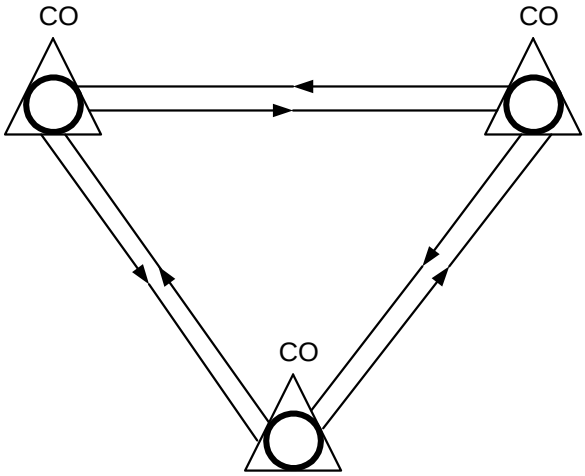


Fig. 3.2. Districtiv Urban Telephone
Network without tandems

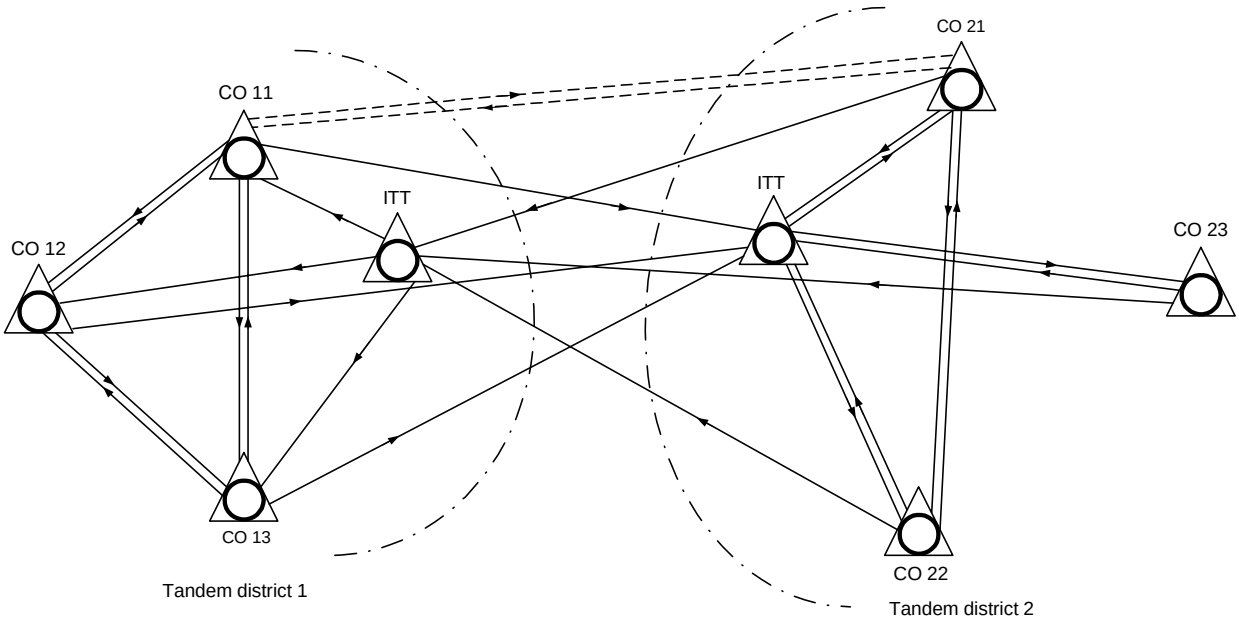


Fig.3.3. Structure of districtive UTN with ITT

d) districtive telephone networks with outgoing traffic tandems and with incoming traffic tandems or with combined tandems (incoming and outgoing) - Fig.3.4; one ITT and one OTT exist in every tandem district; communication between CO's of the same tandem district is established as described in a previous case (see tandem districts 11, 31 and 21); outgoing and incoming tandems of different tandem districts are connected one to another via the trunk groups in accordance with the principle "each outgoing with each incoming" and communication between CO's of different tandem districts is established via tandem OTT (IOTT) of originating CO and via ITT (IOTT) of terminating CO; it is possible to organize routes from cross-bar, quasi-electronic and electronic CO to ITT and CO of different tandem districts, passing over corresponding OTT (dotted line, Fig.3.4.)

e) combined telephone networks which can use (at the same time)several of the above mentioned methods of the districtive urban telephone network design.

During the urban telephone network development it is necessary to make the transition to more complex structures via the intermediate ones, e.g. by organization of the districts in the part of the network, that have the b) structure.

The division of the urban network structure should be done according with the existing situation, and the trend of the network development and with the further optimization of the feasibility parameters.

The most frequently used is and will remain the structure without districts. The optimal capacity of CO's and districts depends on the type of the switching equipment, used number of telsets per area unit and should be defined during project evaluation. Capacity of districts, equipped with step-by-step exchanges should be 100 thousand subscribers, cross-bar - up to 200 thousand, quasi-electronic and electronic - more than 200 thousand.

3.4.4. Communication between any two CO's can be carried out via one or several routes. Among them one can find:

- direct route, using trunk group which connects one CO with another;
- one or two transit routs, each one using one or more trunk groups via tandems. When two or more possible routes exist between two CO's - one of these routes is the main route, and the others are alternative ones. Originating CO calls, that need communication with other COs are, at first, directed via the main route. Calls, that were not serviced the main route because of congestion, form the excessive traffic via that route, that is directed to the terminating CO via alternative route.

The possibilities of the direct route establishing and the selection of the direct and alternative route organization scheme depends on the technical characteristics of the existing switching equipment and feasability parameters.

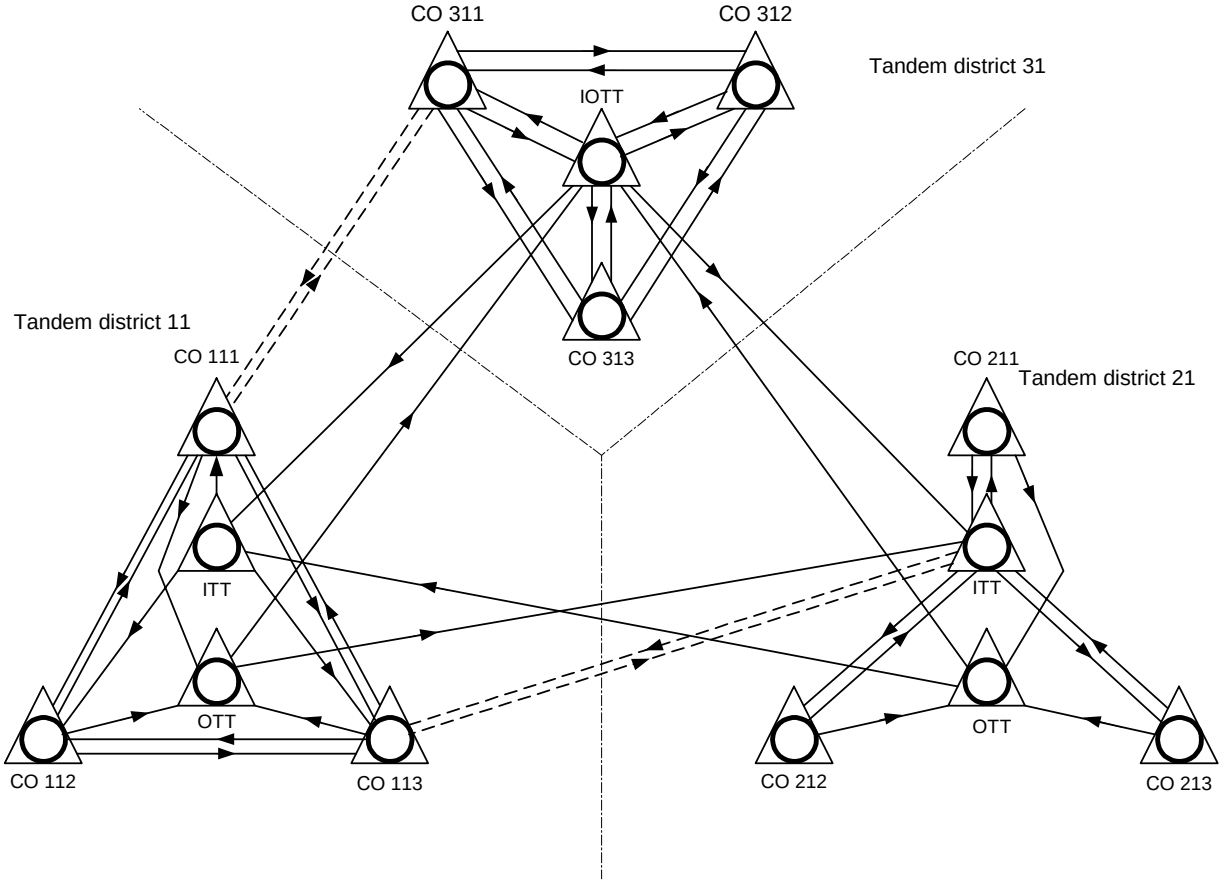


Fig. 3.4. Districtive UTN with ITT and OTT

In contradistinction to the toll network (see p.3.8) main routes (including direct ones) of the urban telephone network are designed, as usual, with high grade of service, and it is possible to use UTN direct routes with high efficiency due to the loss probability increase, if it is confirmed by the feasability study, network vitality and if probability of main routes local overloading is taken into account. Alternative routes are always designed as routes with high grade of service.

3.4.5. At UTNs without tandems its possible to organize communication from step-by-step CO to any other CO only via direct route. For calls from CO of other systems the alternative routes may be organized by using special alternative route tandems.

At UTNs with ITT, or with ITT and OTT, step-by-step exchanges of one tandem district have to communicate with each other via direct routes, by the principle "each with each".

When it is reasonable from the economic point of view, the outgoing intratandem communication of several step-by-step exchanges is organized via the transit routes, that pass through the ITT of its own tandem district; direct routes from such CO to the other district CO are not organized.

Cross-bar exchanges of the same district may be connected with each other using the principle "each with each" and via its own ITT. When we use both above mentioned versions it is possible to organize intratandem communication via direct and alternative routes.

Direct routes between step-by-step exchanges, located in different tandem districts, are not planned. Direct routes between cross-bar CO's of the different tandem districts may be used for communication between CO's of the adjacent tandem districts, if it is economically reasonable and will not cause the numeration losses. Alternative routes between such CO have to pass via the ITT of the tandem district to which the incoming CO belongs.

At UTN with ITT and OTT main routes between cross-bar exchanges of different tandem districts may pass via OTT of the tandem district to which outgoing CO belongs, passing over the ITT of the incoming CO district or pass via ITT of the incoming CO, passing over the OTT of the outgoing CO district. In this case alternative routes have to pass through the OTT of the outgoing CO district and through ITT of the incoming CO district.

Move over, at UTN with ITT and OTT main routes between cross-bar CO of different tandem districts may pass via OTT of outgoing CO tandem district, or pass via ITT of incoming CO, passing over OTT of outgoing CO tandem district, when it is feasible. In this cases the alternative routes should pass through the OTT of outgoing CO district and through the ITT of incoming CO district. When electromechanical and quasi-electronic equipment is used in tandems, the organization of main and alternative routes which pass through more than one OTT and more than one ITT is not allowed because it is impossible to satisfy the loss factors (norms).

3.4.6. When UTN is designed with the use of quasi-electronic and electronic CO, it is necessary to use the following advantages of these systems in comparison with the electromechanical ones:

- large capacity of the exchange;
- possibility of organization of any number of directions (routes);
- possibility of organization of the well developped alternative route system;
- possibility of analysis of any number of digits of the subscriber number;
- possibility of organization of fully-accessible line groups of any capacity.

3.4.6.1. Quasi-electronic systems should be introduced into separate UTN, or into separate tandem districts in complex. If a quasi-electronic CO is introduced on a districtive UTN without tandems during with the network extension, that causes the tandem districts formation, the group of newly installed electronic CO have to form the separate tandem district with quasi-electronic ITT (QEITT).

In this case, and also in the case of quasi-electronic CO introduction on the UTN with ITT, the tandem districts, based on quasi-electronic CO should have the capacity multiple to 100 thousand subscriber numbers for which separate intrazone codes are provided. Communication from existing CO to the quasi-electronic COs is provided via QEITT, but communication of quasi-electronic CO with the existing cross-bar and step-by-step systems is provided via existing ITT.

If quasi-electronic CO are introduced at networks with ITT and OTT (Fig.3.4), it is necessary to organize at such networks the separate tandem districts with the capacity up to 400 thousand subscriber numbers for which the separate intrazone codes are provided. Communication from existing cross-bar (step-by-step) equipment of other tandem districts with the quasi-electronic CO have to be done via cross-bar (step-by-step) OTT, that establish connections to the corresponding quasi-electronic ITT. Communication from quasi-electronic CO to the existing CO also has to be done via cross-bar (step-by-step) ITT, connection to this tandem is established directly from the quasi-electronic CO, or via quasi-electronic OTT.

3.4.6.2. Introduction of the electronic switching equipment has to be done in a such away, that in future it will be able to promote the transition to the completely digital telephone network. Introduction the electronic switching equipment has to be accompanied by introduction of the digital transmission systems, (PCM-30 and PCM-120). In this case the analog - digital convertors should be installed at the remote switches (concentrators) and at the exchanges of existing network.

Depending on specific conditions, electronic exchanges may be installed as host for remote switches, as ITT, OTT, IOTT or as combined switches (CO with tandem).

On districtive UTNs without tandems electronic CO's are connected with each other by principle "each with each", and their communication with existing cross-bar and step-by-step systems has to be established via direct routes, or via combined electronic switches with function of CO and electronic IOTT (Fig.3.5) or via newly installed electronic IOTT, that can carry out the functions of alternative route node (ARN).

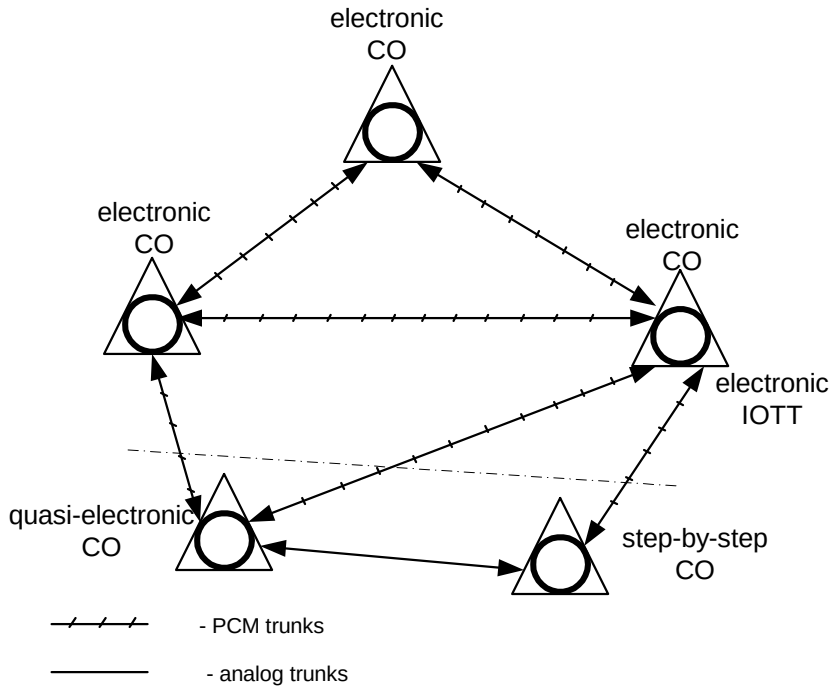


Fig. 3.5. Districtiv UTN without tandems and with electronic CO

If electronic CO introduction at a such network is connected with the network extension, the tandem districts are to be formed, and also if electronic CO are introduced into districtive network with ITT, group of newly installed electronic COs has to form the separate tandem district with the capacity "n" times 100000 subscriber numbers (Fig.3.6). Electronic CO's of this tandem district are connected one to another directly or via electronic IOTT, that may carry out the CO functions at the same time. This electronic IOTT is used for communication of the district electronic CO's with the CO's and tandems of cross-bar and step-by-step systems. Electronic IOTT of different tandem districts are connected one to another by principle "each with each".

Introducing the electronic CO at UTN with ITT and OTT also has to be done by separate tandem districts with allotting the corresponding intrazonal codes for these districts.

It is possible to connect existing electromechanical switches into electronic tandems at the newly installed tandem districts based on electronic equipment. In most of such cases the analog-digital convertors should be installed at the site of existing equipment.

In any connection between two CO's of the same UTN it is allowed to have not more than one analog-digit-analog transition; in connection between two subscriber terminals it is allowed to have not more than 3 such transitions.

An creation of UTN digital tandem districts, in addition to the versions of main and alternative routes organizations, considered in p.3.4.5, the organization of alternative routes between CO of two different tandem districts via the electronic IOTT of the third district is allowed.

Main and alternative routes between tandem are designed as high efficiency routs.

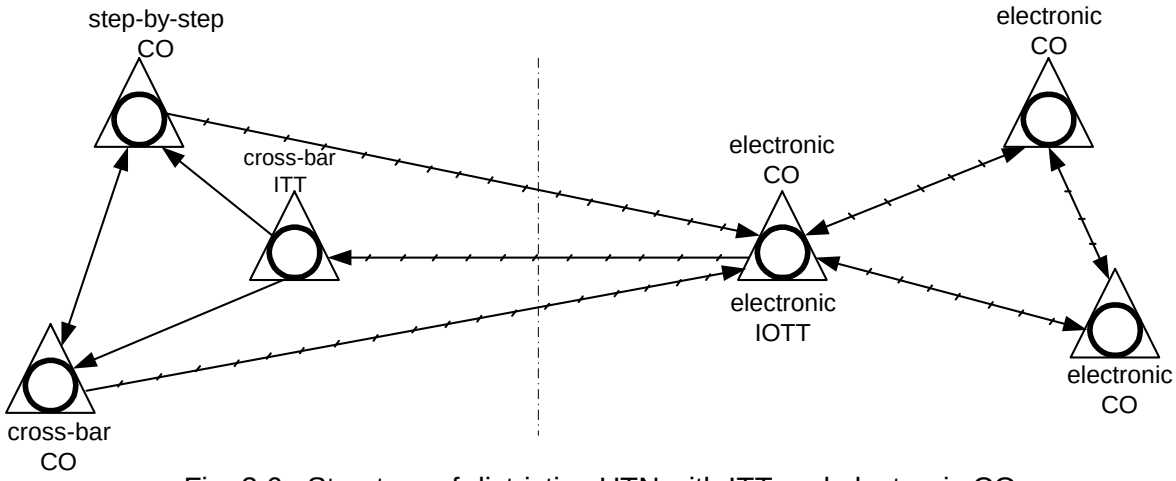


Fig. 3.6. Structure of districtive UTN with ITT and electronic CO

3.4.7. Example of connections between COs and tandems of various systems at UTN with tandems is given at Fig.3.7. Four tandem districts are given at this Fig., the first one is equipped by step-by-step, cross-bar, quasi-electronic CO and the same ITT and OTT, the second - by electronic IOTT, electronic, cross-bar (quasi-electronic) and step-by- step CO, the third - by quasi-electronic CO and quasi-electronic IOTT, and the fourth - the same as the first.

Step-by-step CO within one tandem district are connected with each other and with the switches of other systems by principle "each with each" or via tandems.

Switches of other systems allow communication with COs of their own district via direct as well as via alternative routes. Exactly that way the intratandem connections between two cross-bar (quasi-electronic) COs in tandem districts 1, 3, 4 are organized.

Communication between electronic COs in the tandem district 2, based on the electronic switching systems, is established via direct as well as via alternative routes.

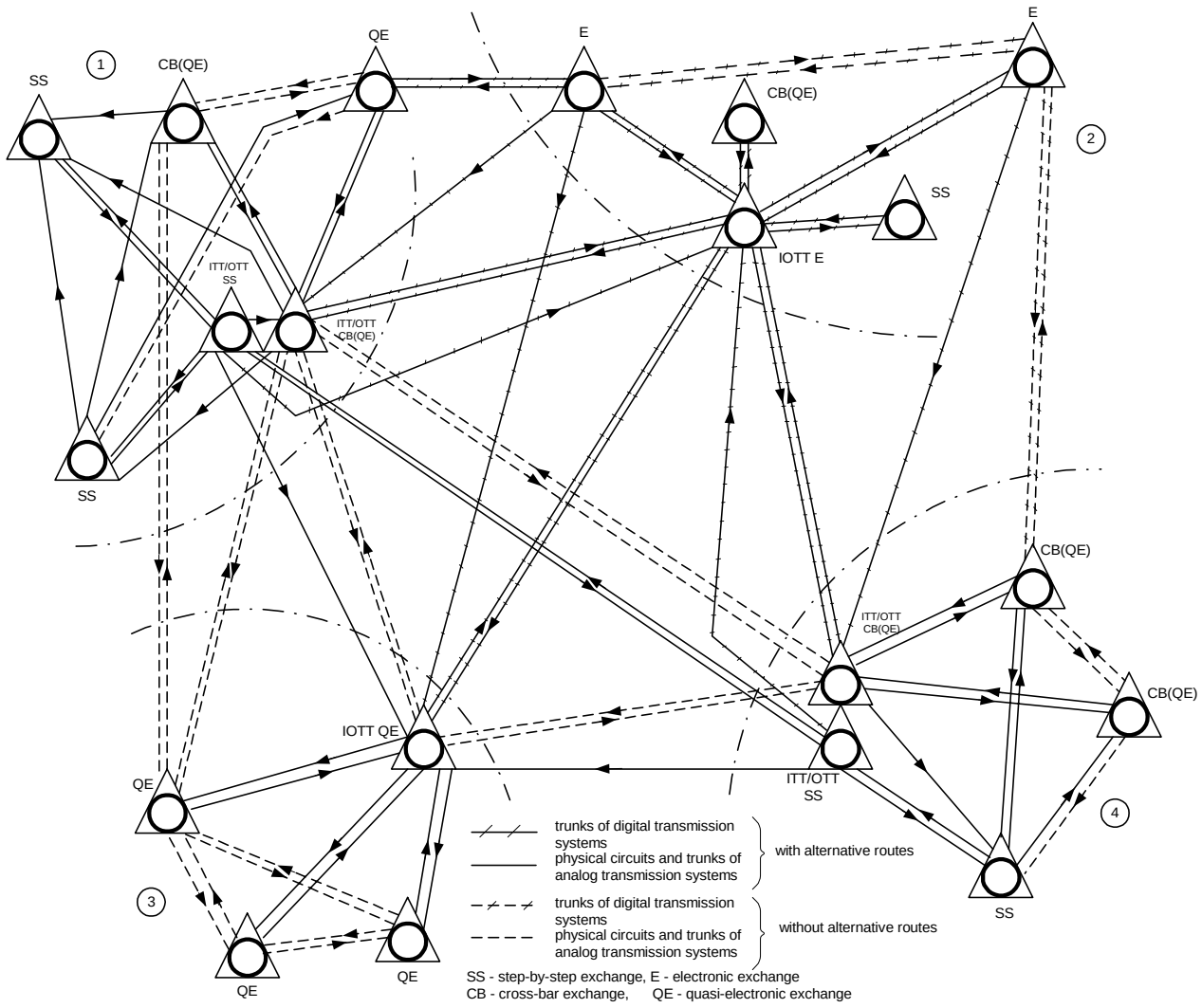


Fig. 3.7. Structure of design of various types of exchanges and tandems at UTN with ITT, OTT and alternative routes

Communication of the 1-st tandem district cross-bar (quasi-electronic) CO with one of the quasi-electronic CO of the 3-d tandem district may be established via direct route, or via two alternative routes: through the cross-bar (quasi-electronic) OTT, via the route, passing over IOTT of the 3-d district and via the route, passing via this IOTT.

Communication of the cross-bar, quasi-electronic and electronic CO of the 2-d tandem district with the CO of other tandem districts may be established via three routes: direct, alternative - via IOTT (ITT) of incoming tandem districts and alternative via electronic IOTT of the 2nd tandem district and IOTT (ITT) of incoming tandem districts.

Intratandem connections in cross-bar and quasielectronic tandems of the 1-st, 3-d and 4-th tandem districts have the alternative routes via the electronic IOTT of the 2nd tandem district. Alternative routes for main routes, which connect electronic CO of the 2-d tandem district with tandems and CO of other districts, are established via the above mentioned electronic IOTT.

The diagram of the alternative routes organization at the districtive UTN without tandems and with the special alternative route nodes is given at Fig.3.8.

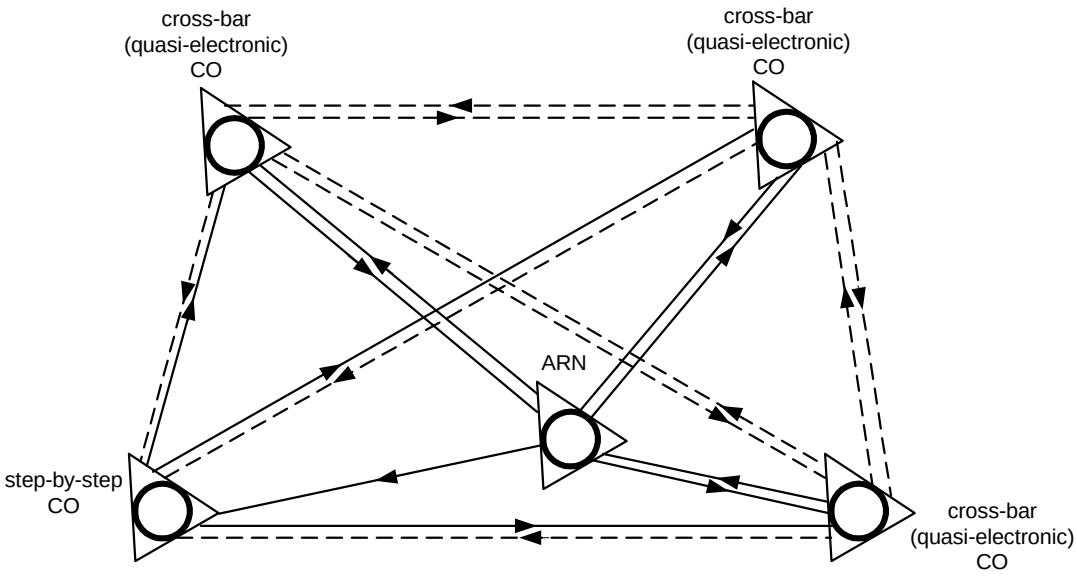


Fig. 3.8. Districtiv telephone network without tandems and with ARN

3.4.8. Suburban networks, if the main part of traffic is directed towards the city, have to be gradually integrated, into the UTN. In this case the suburban network may be the part of UTN, or may be connected like PBX. Urban and rural types of CO may be used as suburban CO.

3.4.9. UTN COs and tandems are connected one to another via single direction trunk groups (incoming and outgoing). Special trunk groups are foreseen for UTN incoming toll communication. Two-wire switch of speech paths is foreseen at UTN step-by-step, cross-bar, quasi-electronic CO and step-by-step tandems. Electronic CO and tandems provide four-wire switching of the speech paths.

Cross-bar and quasi-electronic UTN tandems can provide two-wire or four-wire switching of speech paths; four-wire switching is foreseen for the cases when it is necessary to establish the connection between two four-wire routes.

To provide the reception of information by state organizations from inhabitants in the urgent cases and to provide special services (information, orders, etc.), various special services should be organized at UTN.

Centralized as well as decentralized special services may be used at districtive UTNs. Examples of access to such services are shown at Fig.3.9.

Access to centralized services from UTN subscribers is provided, as usual, via incoming special traffic node-special services node (SSN).

Depending on local conditions the following is possible:

- access to separate services from some COs passing over special services node SSN (for example, CO-4 has an access to the special services 01, 02, 03, 04 and 07 via SSN and to other special services - passing over SSN;

- introduction of more than one SSN on the network (for example, for CO-3, CO-8 and CO-9, which are removed from the main city territory, the SSN-2 special services access is foreseen)

- providing for some COs the access to the SSN via the common trunk group through the special outgoing tandem (OTT-0); (in order to economize the number of trunk lines between the SSN and the group consisting of CO-5, CO-6, CO-7, located closely to each other and relatively far from SSN).

For several auto announcement services (for example, time service) it is possible to use the access system based on the distribution of information, that is transmitted by above mentioned special services to all CO via peermanent (not switched) special trunks. Subscriber connection to such trunk is provided at the CO to which the subscriber line is connected.

Selection of one or other way of access to special services depends on parameters of feasibility.

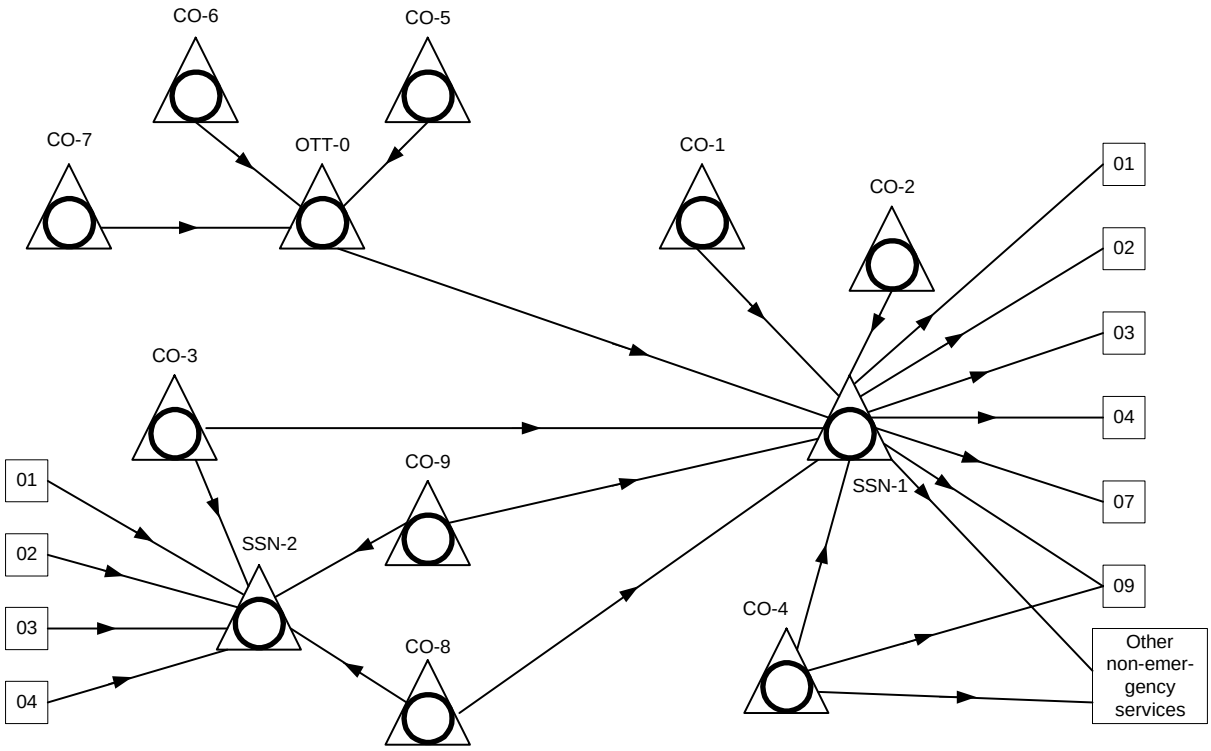


Fig.3.9. Versions of communication with special services

For the most effective communication with the special service 02, the connection of the service central desk to the CO and connection of the district branch office of the militia desk (telephone set), with corresponding evolvement of the CO, is allowed (it is realized when necessary equipment and space exist).

3.4.12. The possibility of four types of pay-phones use should be foreseen at UTN:

a) Local pay-phones of one-way operation for outgoing communication with UTN subscribers

b) Local pay-phones of two-way operation for outgoing communication with UTN subscribers

c) Pay-phones for communication with payed, information and ordered UTN services

d) Toll pay-phones for automatic outgoing intrazonal and toll communication

e) Multipurpose pay-phones for local and toll communication

Pay-phones of types a), b), d), e) may be connected to CO. Pay-phones of types c) may be connected to toll exchange.

B) - type pay-phone should be connected directly to the switching equipment of SSN. Free of charge communication with emergency services should be provided from a), b), c), e) - type pay-phones.

3.4.13. CO communication with the toll exchange, located in the same or other city, is established via the trunks of urban and intrazonal telephone networks (see p.3.7).

3.5. ARCHITECTURAL PRINCIPLES OF RURAL TELEPHONE NETWORKS

3.5.1. Radial structure (one-stage scheme) and radial node structure (one- and two-stage scheme) with the possibility of use of direct and alternative routes, should be foreseen at Rural Telephone Networks (RTN). In accordance with the above mentioned RTN architectural principles, the following is used (Fig.3.10):

- CO, located in the district centre, carrying out the functions of district CO and RTN transit node at the same time. In case of radial structure, trunk lines from terminal offices are connected to CO, and in case of radial-node struction - from terminal and tandem offices; communication with automatic toll exchange (ATE) and with manual toll ex change (MTE) is established via CO;

- tandem offices located in any point of rural district, are the terminal - tandem exchanges, to which subscriber and trunk lines from terminal and central offices are connected.

- transit communication between terminal offices is established via tandem office, as well as a connection between these terminal offices and CO or other tandem office (via direct routes between different tandem offices).

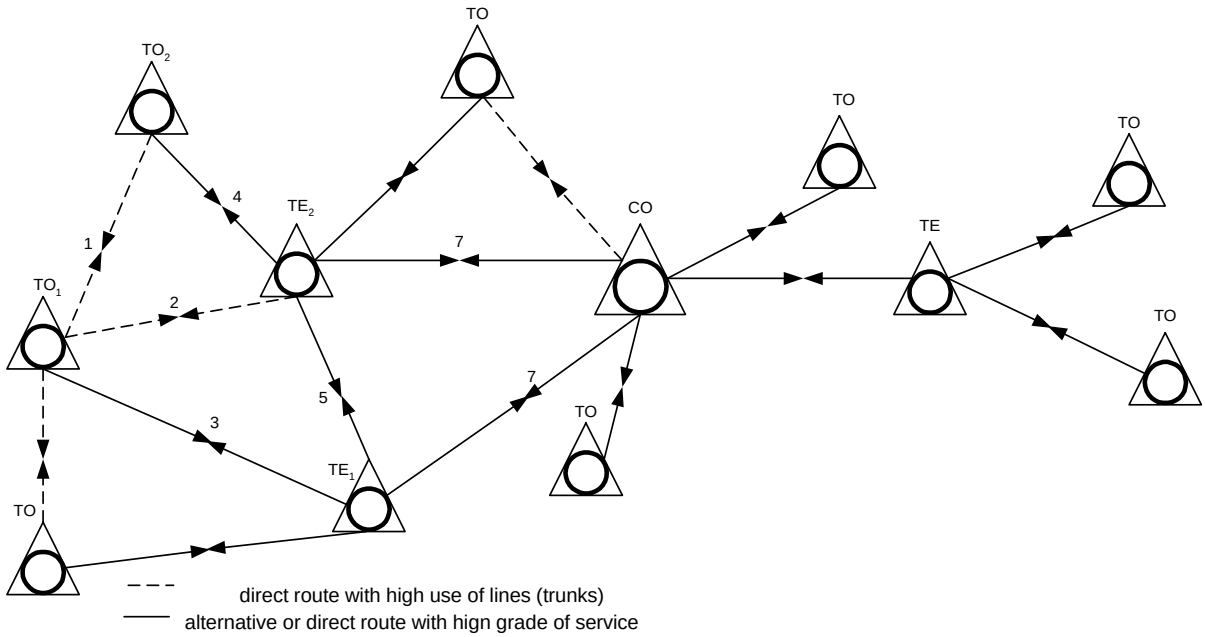


Fig. 3.10. Схема построения сельских телефонных сетей

- terminal offices located in any point of rural district; terminal office trunk lines (depending on network architecture les) are connected to CO or tandem office and also to other terminal and tandem offices (via direct routes between terminal offices or between terminal offices and other tandem offices).

One-stage RTN structure in comparison with the two-stage one makes the exchange equipment more simple, increases the communication reliability and quality of speech path and speeds up the connection establishment. That's why the onestage scheme is more preferable and perspective.

Two-stage structure is allowed to use only when it is feasible to use tandems.

3.5.2. Tandem offices and CO should provide four-wire transit. CO capacity may be from fifty to several thousand subscriber numbers.

3.5.3. It is necessary to use direct and alternative routes for the purpose of communication reliability and vitality increase, for better use of switching equipment and for overloads control.

The direct routes between the terminal office and tandem office may be foreseen if there is significant traffic between them and employment of quasi-ellectronic program controlled CO.

Direct routes between terminal offices tandem offices, terminal office and tandem office with high use of trunks (with relatively large losses) may be established when there are alternative routes with high grade of service (small losses). The network structure should be selected depending on feasibility parameters. At Fig.3.10. between terminal office-1 and terminal office-2 the following routes are possible:

- direct route: Terminal 0.-1 - I - Terminal 0.- 2

- alternative routes:

1-st route: Term. 0.- 1 - 2 - Tand. 0 - 2 - 4 - Term. 0.- 2

2-d route (the last selection route): Term. 0. - 1 - 3 - Tand. 0. - 1 - 5 Tand. 0. - 2 - 4 - Term. 0 - 2

When semielectronic exchange-3 type exchange is used as Terminal office-1 and semielectronic exchange –1 type exchange is used as tandem office, it is possible to use only first alternative route.

When ATCK-50/200M -type exchange is used as terminal office, it is possible to organize one alternative route via it's own tandem office (CO) for each direct route.

When ATCK-100/2000-type exchange is used as terminal or tandem office, the establishment of outgoing communication with alternative routes is not provided.

3.5.4. It is necessary to use analog-digital quasi-electronic CO semielectronic exchange -type, quasi-electronic CO 3 semielectronic exchange -C type and cross-bar CO at any stage of RTN. For establishing the automatic toll and intrazonal communication it is allowed to retaine existing step-by-step systems as CO, tandem and transit offices but with introducing the ANI equipment.

In this case, the transit node with equipment, providing four-wire transit should be organized at step-by-step CO. If it is necessary to provide the four-wire transit at the tandem office, the step-by-step equipment should be substituted. If outgoing automatic intrazonal and toll communication is introduced, it is necessary to substitute the exchanges of ATC-50/100, ATC-BPC-20M, ATC-10/40, ATC-40/80 types.

Analog-digital quasi-electronic exchanges (ИАТСКЭ) and quasi-electronic systems (АТСК-С) may be used for only on-their basis network design, as well as for RTN upgrading without changes if RTNs are already equipped by cross-bar and step-by-step systems. It is recommended to introduce such systems in a concentrated monner, so that it will be possible to equip separate RTN by the same type equipment as quickly as possible.

It is recommended not to introduce perspective CO of different systems at one RTN.
In this case, on those RTN, where it is foreseen to use semielectronic exchange

it is recommended to use, basically, PCM equipment for interexchange communication.

It is allowed to use physical circuits at quasi-electronic exchanges-1 - quasi-electronic exchanges -3, physical circuits and channels of analog transmis sion systems for communication between two quasi-electronic exchanges-1, and also for quasi-electronic exchanges -1 communication with the other systems.

The total number of analog-digit-analog transitions within one RTN may be not more than 4.

3.5.5. When quasi-electronic exchanges-type is used, the radial architecture of RTN in the integral mode is more preferable.

It is allowed to design RTN using radial-node principle, where quasi-electronic exchanges -1 is used as tandem and central offices. Communication organization at RTN with combined switching equipment, if quasi-electronic exchanges (ИАТСКЭ) are used, may be done in accordance with one of the following versions:

a) The quasi-electronic exchanges (ИАТСКЭ) type are used as tandem, terminal and central offices (on radial-node architectural principle of network) and as terminal and central offices (on radial network architectural principle) (Fig.3.11).

b) The quasi-electronic exchanges (ИАТСКЭ) type are used as tandem and terminal offices.

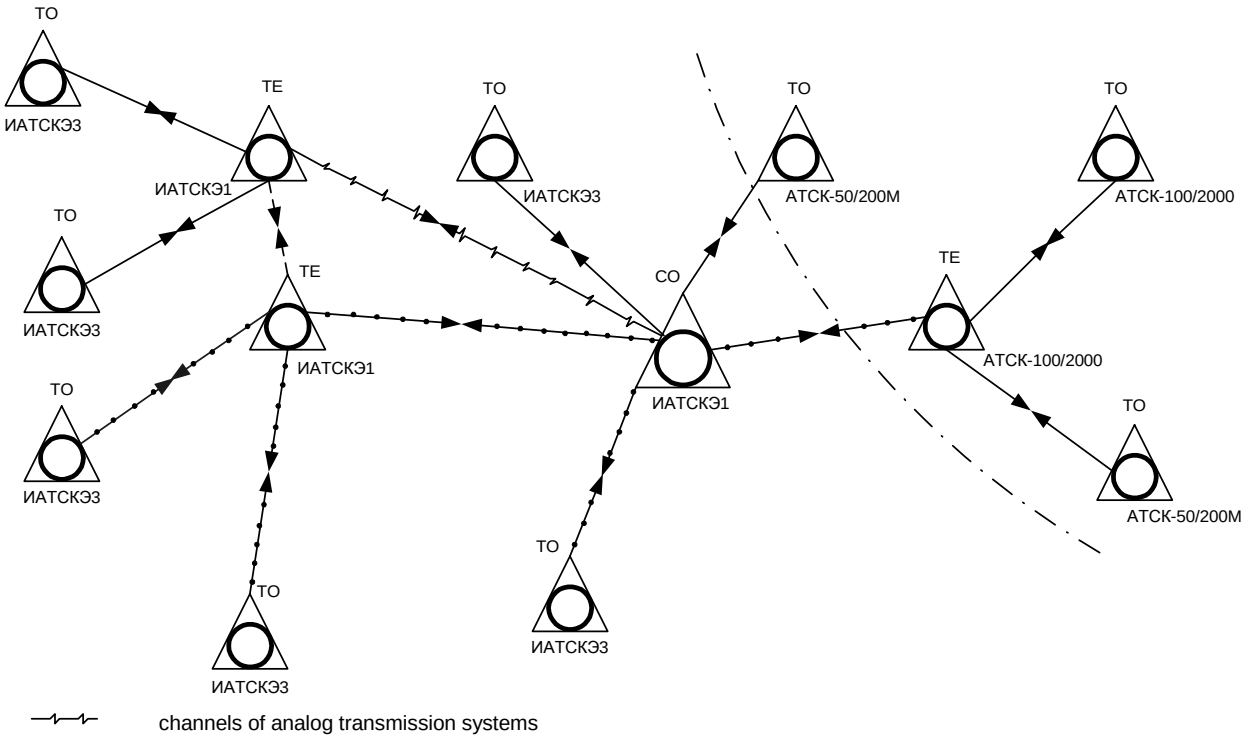


Fig. 3.11. RTN structure where ИАТСКЭ is used as CO, TO, TE

3.5.6. Trunk lines of one-way and two-way operation may be used at RTN, as usual, they are the same for local and toll connections.

The trunk group type selection (one-way or two-way) and also decision on separate use of trunk groups for local and toll connections are feasible.

3.5.7. Depending on local conditions the following ways of introduction of the switching equipment to RTNs are foreseen:

- service of farm by one terminal (transit) office, when it's directly connection to CO;
- service of farm by several terminal offices, forming the single tandem district with the tandem office located at the central buildings of the farm and these terminal offices are located in the branches and departments of the farm (if the quasi-electronic exchanges (ИАТСКЭ) is used, it is possible not to introduce tandem office, and all terminal offices have to be connected to the CO);
- service of several farms by one terminal office.
- service of several farms by separate terminal offices and by common tandem office related to one of these farms.

3.5.8. The possibility of connections with inquiry, ordered and emergency services should be provided at RTN. The emergency services should be organized in the district centre, and, if it is necessary, -in other points of rural district. Moreover, the organization of reference and ordered services should be foreseen in the district centre.

In the district centre with non-districtive telephone network the SSN is organized directly at CO. Communication with emergency services, connected into central, tandem or transit offices should be provided for all rural subscribers, including PBX subscribers that have no access to the PSTN.

3.5.9. For the goal of economical design of RTN subscriber line network, depending on feasibility parameters, shared extension line with or without communication between the subscribers sharing the line and concentrators may be used.

3.5.10. At RTN the same pay-phones as on UTN ones can be used (see.p.3.4.12).

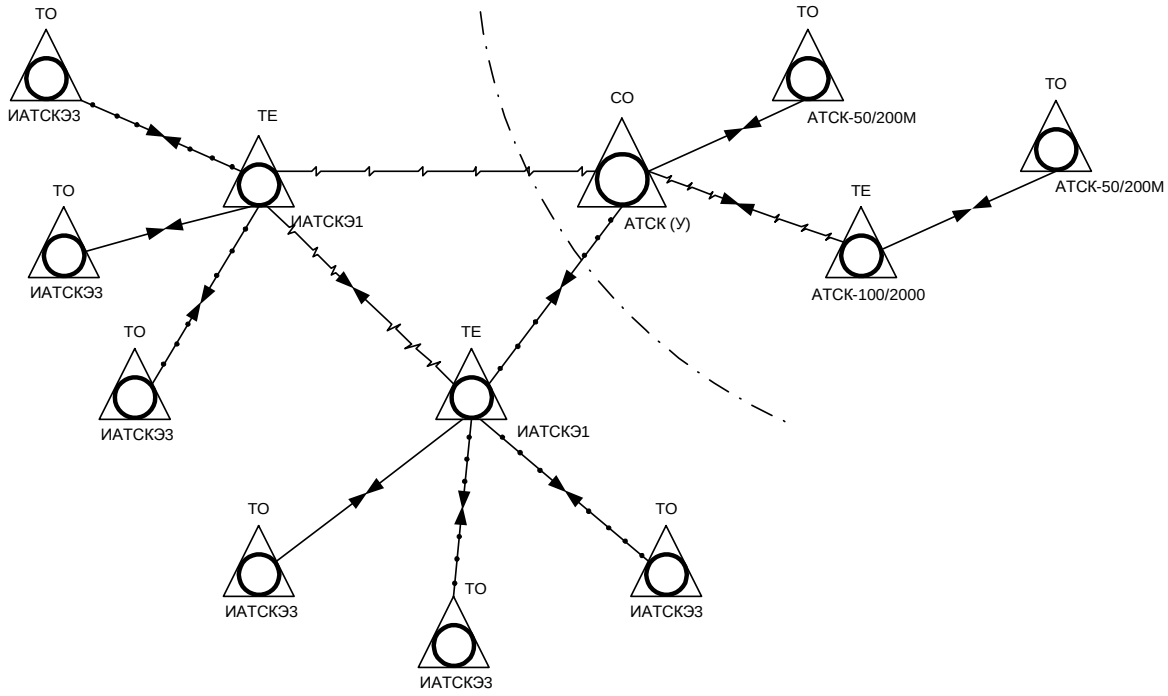


Fig. 3.12. RTN structure, where semielectronic exchange is used as TO and TE

3.6. ARCHITECTURAL PRINCIPLES OF COMBINED TELEPHONE NETWORKS

UTN and RTN form Unified Local Combined Telephone Network (CTN) in the case when district centre or large city (centre of district or region) that have districtive UTN, is the centre of the rural district at the same time.

Besides, the incoming and outgoing transit node of rural-suburb communication (RSN) or CO should be foreseen at UTN; communication between RTN switches, between RTN and UTN switches, and outgoing and incoming toll communication of RTN subscribers may be established via above mentioned RSN and CO.

Various architectural principles of CTN, depending on capacity and structure of UTN and on types of switches are possible.

3.6.2. If the city has districtive network without tandems and the total capacity of combined network does not exceed 80.000 subscriber numbers, at this network RSNs or CO, to which rural switches are connected, may be introduced.

Urban district CO and RSN (CO) are connected by the principle "each with each" (Fig.3.13), suburb CO, depending on local conditions, may be connected to UTN directly as CO or PBX or via RSN (CO).

3.6.3. If the city has districtive telephone network with tandems, it is necessary to organize RSN (may be several RSNs), that are connected to UTN as IOTT and toll IOTT of 100 thousand tandem district (Fig.3.14;3.15). In this case suburban CO is also connected to UTN as CO or PBX, or via RSN.

3.6.4. RSNs(COs), introduced at UTN may be based on switching equipment АТСК, АТСКУ, quasi-electronic exchanges (ИАТСКЭ) and quasi-electronic systems (АТСК-С) -С-types and also electronic switch with the use as suburban CO. When the CTN capacity is not more than 80.000 subscriber numbers it is possible to use АТСК-100/2000 as RSN (CO), RSN equipment as well as CO should provide four wire transit. When selecting the type of equipment it is necessary to take into account the following: it's throughput should be sufficient to service the transit traffic.

3.6.5. Communication with reference ordered and emergency services for rural subscribers of CTN is organized the same way as it is defined in p.3.5.8., and for district centre subscribers of districtive telephone network in the same way as to UTN (p.3.4.11).

3.6.6. Pay-phones of CTN are the same with UTN ones (p.3.4.12).

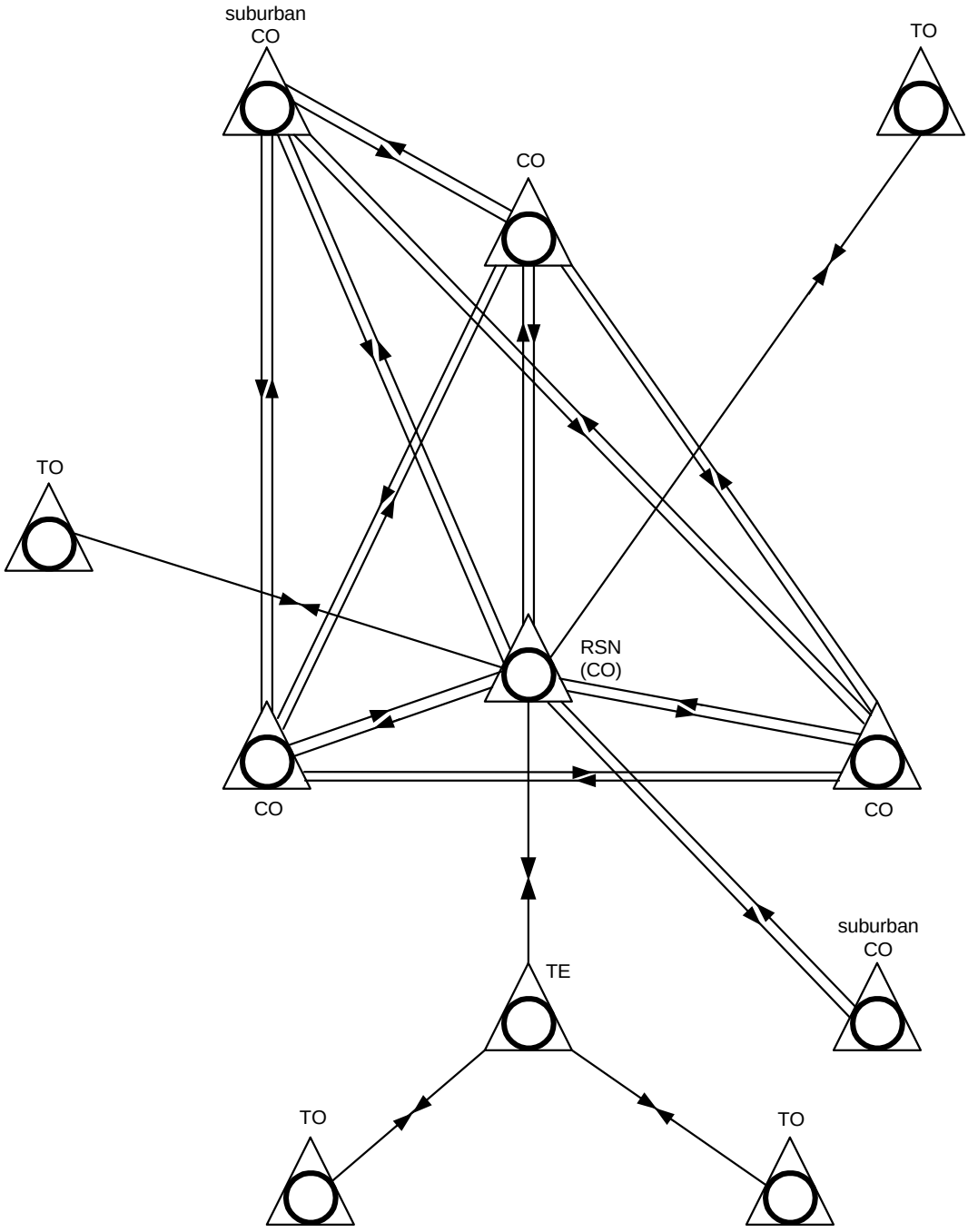


Fig. 3.13. Combined telephone network based on districtive UTN without tandems

3.7. ARCHITECTURAL PRINCIPLES OF INTRAZONAL TELEPHONE NETWORK

3.7.1. Intrazonal telephone network should provide connections between COs and tandems of various local networks of the same zone and of international networks.

3.7.2. Intrazonal telephone network is a combination of automatic toll exchanges (ATE), that are the part of the toll network at the same time, of zone telephone nodes (ZTN), of ordered trunk lines and toll trunk lines, that connect local networks with ATE and ZTN, and of channels, that connect zone ATE and ZTN between each other and district centre MTE with ATE.

Ordered trunk lines from ordered trunk line nodes - OTLN (CO, RSN, OTT) to ATE (ZTN) and toll trunk lines from ATE (ZTN) to incoming toll traffic tandems - ITTT (CO, RSN) are the constituent part of intrazonal network.

Note: Part of ordered trunk lines from district CO to OTLN and part of toll trunk lines from ITTT (RSN, CO) to district CO are related to local network.

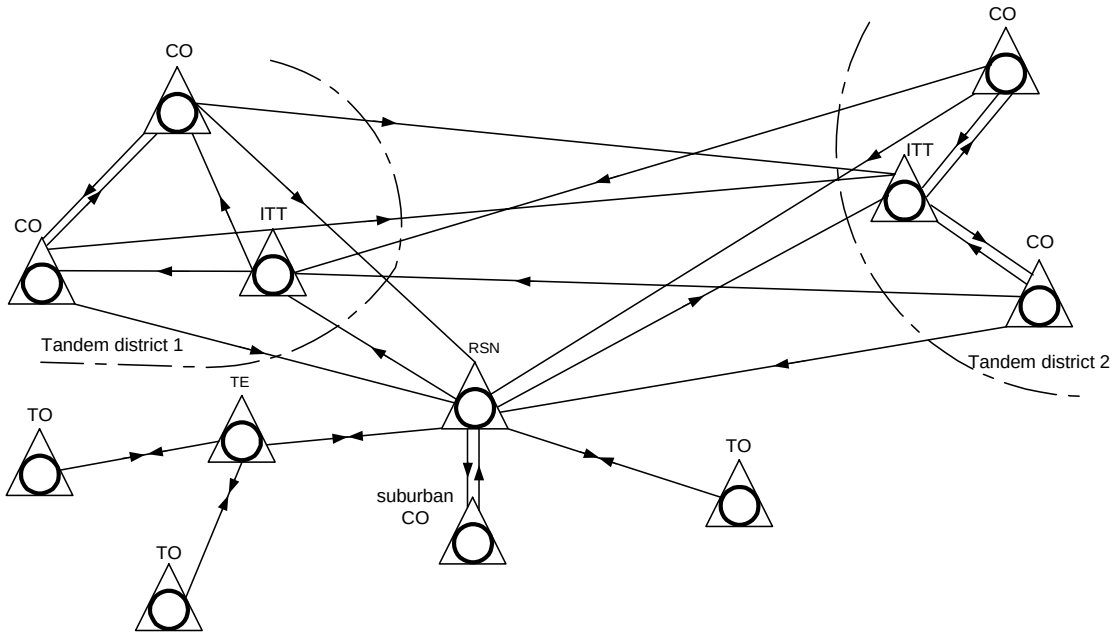


Fig. 3.14. Structure of combined telephone network based on districtive UTN and ITT

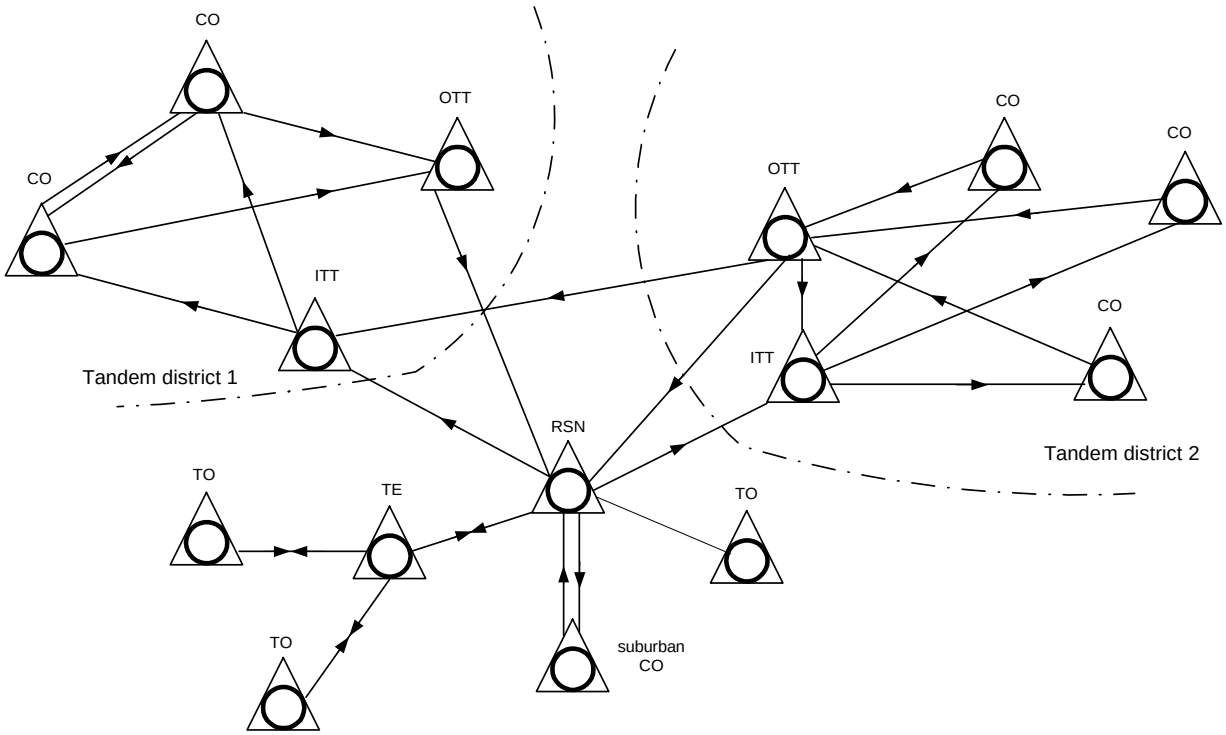


Fig. 3.15. Structure of combined telephone network based on UTN with ITT and OTT

3.7.3. If it is feasible, one or several ATE's may be installed at intrazonal network.

ATE should be introduced at the zone centre. It is a district (republic) centre, if the zone coincide with the district by territory, or it is the most significant city, the city that has large gravitation to points of its own zone and to other zones, if such zone covers only the part of a district (republic).

ATE introduction at the other points of the zone should be feasible.

At perspective, with the wider automatization of the zonal telephone network and more significant gravitation between local networks, conditions for introduction the zone telephone nodes (ZTN) may emerge.

3.7.4. When ATE and ZTN are installed at intrazonal network, every local network of the zone is connected to ATE, or to ZTN via ordered and toll trunk lines with high grade of service.

Access of the local network subscribers, connected to ZTN, to the toll or international networks should be done via ATE, which is the host (the nearest) exchange for that ZTN.

At the second stage of development the use of ZTN is not foreseen.

3.7.5. All connections between exchanges and tandems of various local telephone networks of the zone are established through the ATE via the alternative routes: intermediate (IAR) and the last selection route (LSR).

It is impossible to establish direct routes between local networks.

3.7.6. In individual exceptional cases connections between closely located points of one or different zonal networks may be established via the cross lines, passing over ATE.

3.7.7. Structure of intrazonal network with one ATE within the zone is the most frequently used. In this case the intrazonal telephone networks are designed by radial principle, i.e. every local network is connected to ATE via OTL for outgoing connections, and via TTL- for incoming connections (Fig.3.16):

Communication with local networks of the zone is shown at Fig.3.16.: UTNs of the zone centre, RTNs (or CTNs) of the districts, and also UTN of the other towns of the region, which are not the district centre. (local network of such city is designed according to the (UTN principle).

3.7.8. When several ATE exist within the zone, the intrazonal network may be designed with the use of alternative routes. The architectural principles of intrazonal networks depend technical possibilities of introduced ATE's and on parameters of feasibility.

3.7.9. When it is necessary to introduce several ATE indifferent cities of the zone, the network structure were local networks are separated on ATE basis, is recommended; i.e., every local network is connected with host ATE by OTL and TTL with high grade of service (Fig.3.17). This local networks may be connected with other ATEs via TTL groups of high grade of service if there are enough traffic between them and if possibilities of ATE permit. All zone ATE should be connected via trunk groups with high grade of service, using "each with each" structure.

Every zone ATE should have it's own incoming and outgoing group of LSR trunks to the automatic switch node (ASN) (to its own and adjacent).

If the traffic is high enough, every zone ATE should have it's own outgoing direct route (DR) trunk group to any other ATE of the network and outgoing IAR trunk group to other ASN.

Incoming direct routes from ATE of other zones are connected in the following way depending on technical possibilities of outgoing zones ATE.

From each outgoing ATE, which satisfies the UATS (system) standards, incoming direct routes to each zone ATE may be established, it is necessary for ATE to access local network (by means of TTL with the high quality grade of service).

Only one direct route may be established from each outgoing ATE - 2,3 (non-system), this route is connected, as a rule, depending on the structure of traffic, to one of the zone exchanges.

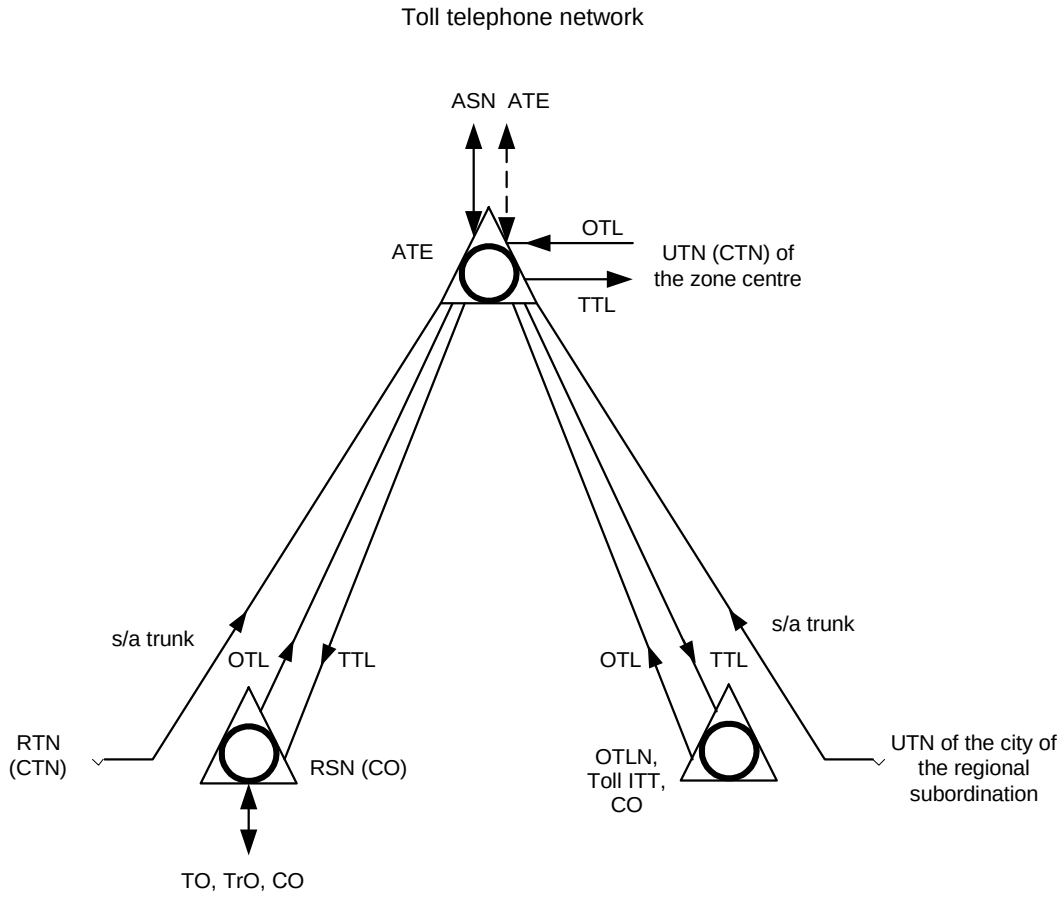


Fig. 3.16. Structure of intrazone network with one ATE

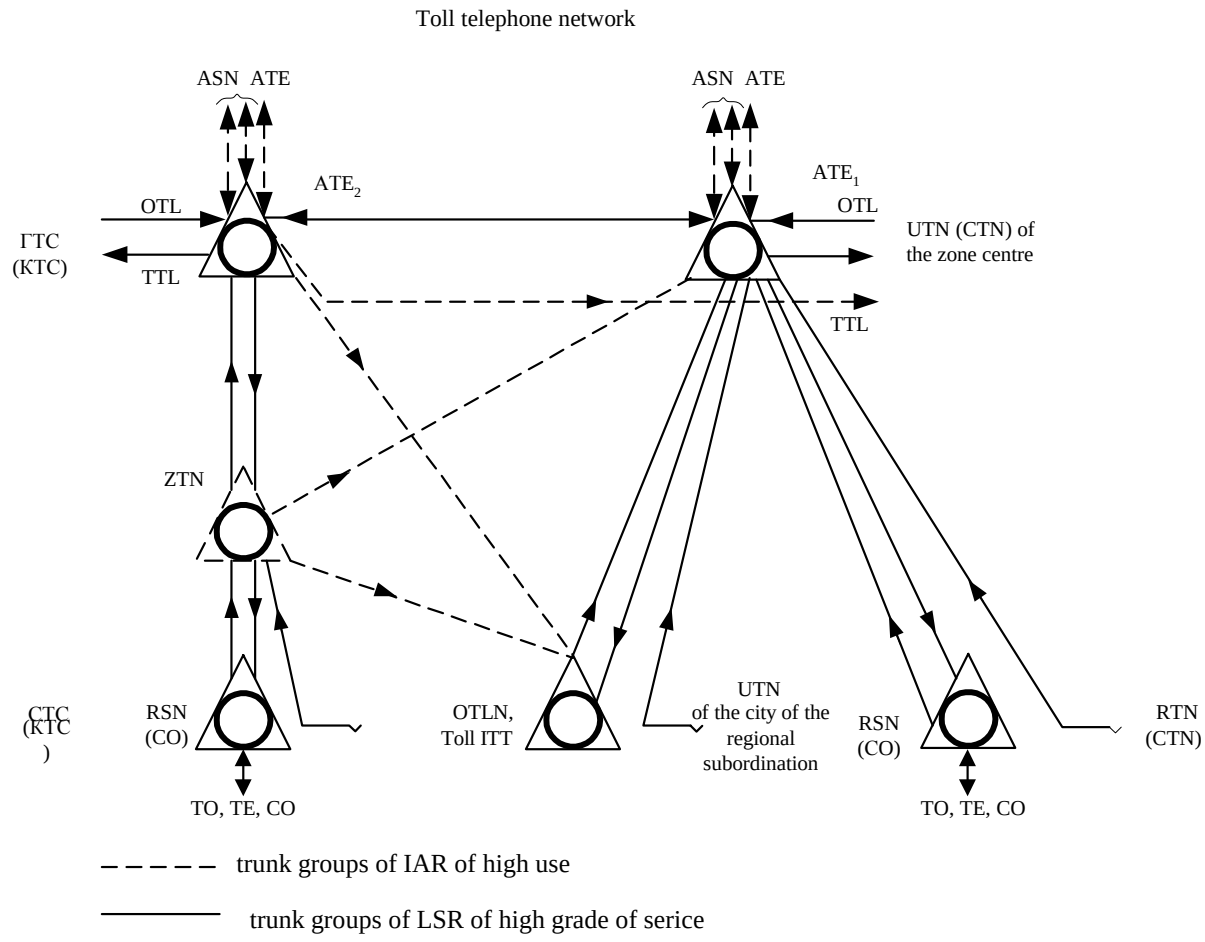


Fig. 3.17. Structure of intrazone network where several ATE are location in different cities of the zone

Connections between local networks of the zone may be established via the following routes:

IAR: RSN (CO) - ZTN - Toll ITT;

IAR: RSN (CO) - ZTN - ATE1 - RSN (CO), Toll ITT;

IAR: RSN (CO) - (ZTN) - ATE2 - Toll ITT;

LSR: RSN (CO) - (ZTN) - ATE2 - ATE1 - RSN (CO), Toll ITT.

Note:

Local networks, connected to different zone ATE should have different first digits of the intrazonal code (different "a") when system and non-system ATE are installed in the zone.

3.7.10. If several zone ATE are located in one city, the version of intrazonal structure, where all local networks should be connected with one ATE by TTL groups of high quality, is recommended, but with other city ATE local network may have no connections, or it may be connected by TTL groups of high grade of service, or TTL groups of high use.

Every local network is connected as usual to one ATE via OTL groups.

All city ATEs should be connected one to another via the trunk groups of high grade of service: communication between special COs may also be established via these trunk groups.

Every city ATE to which OTL are connected, should have it's own access to outgoing toll communication, for incoming toll communication all city ATE are considered as one ATE, i.e from each outgoing ATE of the Toll Network only one direct route group for all city ATE is foreseen, this group may be connected to one or several city ATEs.

The LSR group from ASN should be connected to ATE, which have access to all local networks via TTL with high grade of service.

Communication between local networks may be established via the following routes:

IAR: RSN (CO) - ATE2 - Toll ITT;

LSR: RSN (CO) - ATE2 - ATE1 - RSN (CO), Toll ITT.

Notes:

1. When two system ATE are installed in the city, the following is possible: from the toll network point of view one ATE executes the functions of outgoing exchange (all zone OTL and all outgoing toll trunks are connected to it), and the other ATE executes the functions of incoming exchange (all incoming toll trunks and TTL of high grade of service are connected to it).

2. When system and non-system ATE are installed in the city, the following is recommended: every ATE is connected with all local network of the zone via the TTL of the high grade of service. For incoming toll communication it is recommended to connect ASN and system ATEs of the toll network with the system ATE of the zone, and non-system ATE - with non-system.

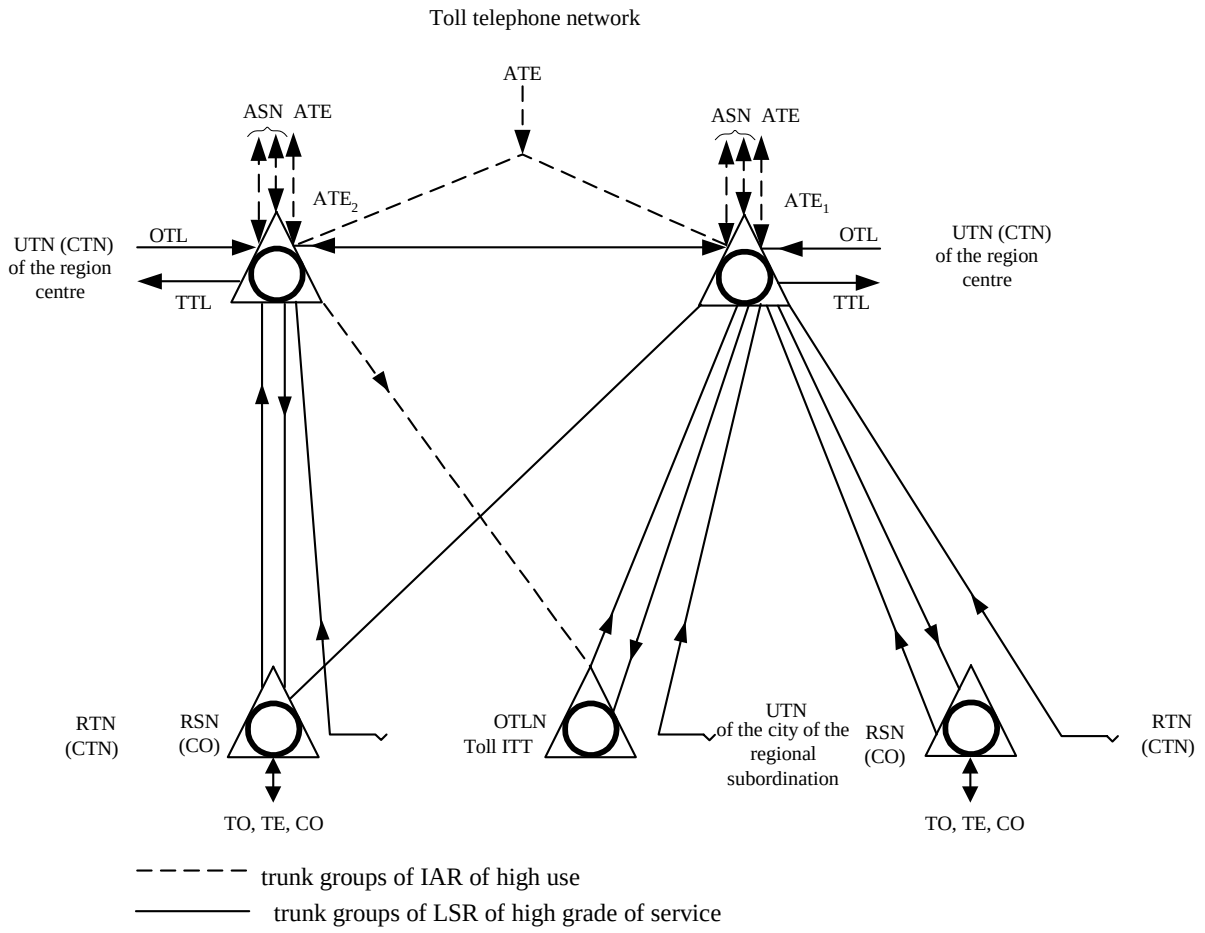


Fig. 3.18. Structure of intrazone network where several ATE are locatied in one city of the zone

3.7.11. From MTE of all zone district centres the outgoing trunk groups of the semiautomatic communication, that are connected to the host ATE (or ATE of the district centre) should be foreseen.

Note:

At perspective, if the high extent of the zone and toll communication automatization is reached, it will be possible for operators of the district centre MTE to have an access to ATE via OTL.

3.7.12. When two or more numbering zones are organized within the zone the following factors are decisive when the borders are determined:

- theoretical telephone capacity (that exceeds 8 mln subscriber numbers, in perspectivet);
- number of involved local networks and 100 thousand districts (exceeds 77),
- economic factors (large territory, peculiarities of the administrative division, primary network configuration etc.)

Two versions of network division inside zones are possible:

1 version: Region is divided into zones by territory, if the number of local networks exceeds 77, or because of economic factors, i.e. each zone includes the part of the region local networks.

Communication within these zones is organized using intrazonal principle, and between the zones - using toll principle.

2 version: If 7-digit numbering of the region centre UTN exhaust the zone capacity, the local network of the region centre organizes a separate zone (urban), and other local networks of the region organize an other zone (regional).

One or several ATE may be in urban,as well as regional zones. Regional zone ATE location depends on economic and organizational factors.

Communication within the urban zone is organized using local network principles, and within the regional zone - using the intrazonal ones.

Communication between urban and regional zones is organized:

- from urban zone to the regional through ATE of urban network and then via TTL to CO of the regional zone local networks;

- from regional zone to the urban - from CO of the regional zone local networks via the separate OTL group to the ATE of the regional zone.

For communication between two above mentioned zones, the special regional ATE may be installed in the urban zone (Fig.3.19).

In this case, OTL of the local networks of regional zone subscribers are connected to the regional ATE to provide access to urban zone.

Urban subscribers access to the local networks of the regional zone may be organized through the urban ATE, or via LSR through the urban or regional ATE.

3.7.13. Versions of outgoing automatic toll and intrazonal communication organization via the OTL are shown at Fig.3.20 from the left hand.

ATE may be located in the cities, local networks of which are designed using principles of UTN and CTN of various capacity.

At local network, where ATE is located, the direct connection of each CO with the ATE is usually foreseen. CO may be connected with the ATE via the OTT, if the last one exists.

For group of COs of any type network OTL nodes (OTLN) may be organized, selection of the organization version of CO - ATE communication depends on feasibility account.

At local networks without ATE for goals of communication of all CO with the zone ATE the common OTL group that is connected at the UTN (CTN) to the OTLN or RSN, is organized. If it is economically feasable, connection of the CO with the ATE via the separate OTL group, passing over the RSN (OTLN), is allowed.

More over, the outgoing trunks of the semiautomatic communication are foreseen (* - at diagram). Rural network exchanges are connected to ATE via the common OTL group, which is connected to CO or RSN.

Versions of organization of incoming automatic toll and intrazonal communication via the TTL are shown at Fig.3.20.

For communication with subscribers of the districtive UTN (CTN) with tandems, the toll ITT is organized within the UTN (CTN), each toll ITT is connected with ATE via TTL group.

If toll ITT services more than one 100 thousand subscriber group, then communication from ATE to toll ITT may be organized via one common group of TTL, or via TTL groups, separate for different 100 thousand groups. For communication with the subscribers of the city with the districtive network without tandems at the territory of which the ATE is located, every CO is connected with ATE directly via the TTL group; and if ATE is absent - via the common TTL through the specially organized toll ITT. In separate cases direct communication with CO is allowed (** - at the diagram).

The TTL group for communication with RSN (CO), that connects ATE with RSN (CO) is foreseen. Suburb exchanges are connected to ATE as CO or via CO.

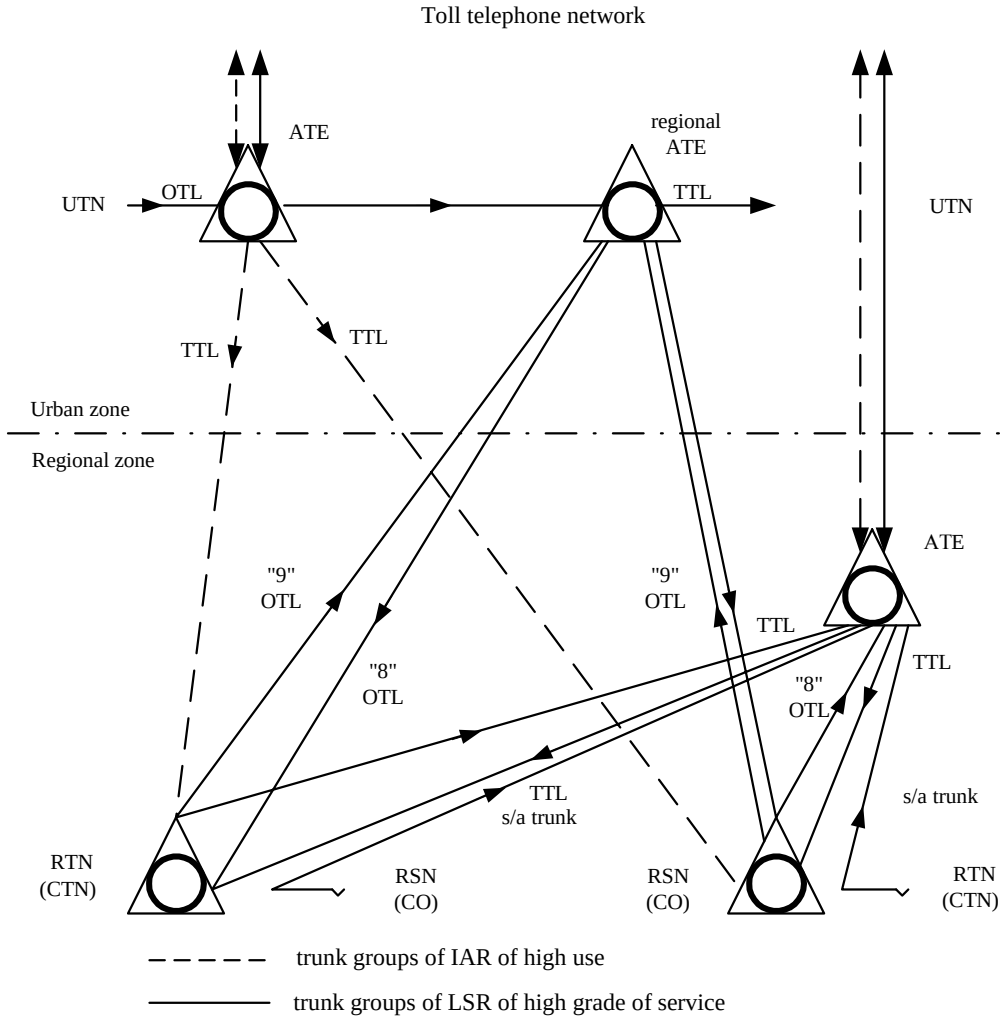


Fig. 3.19. Organization of communication between urban and regional zones

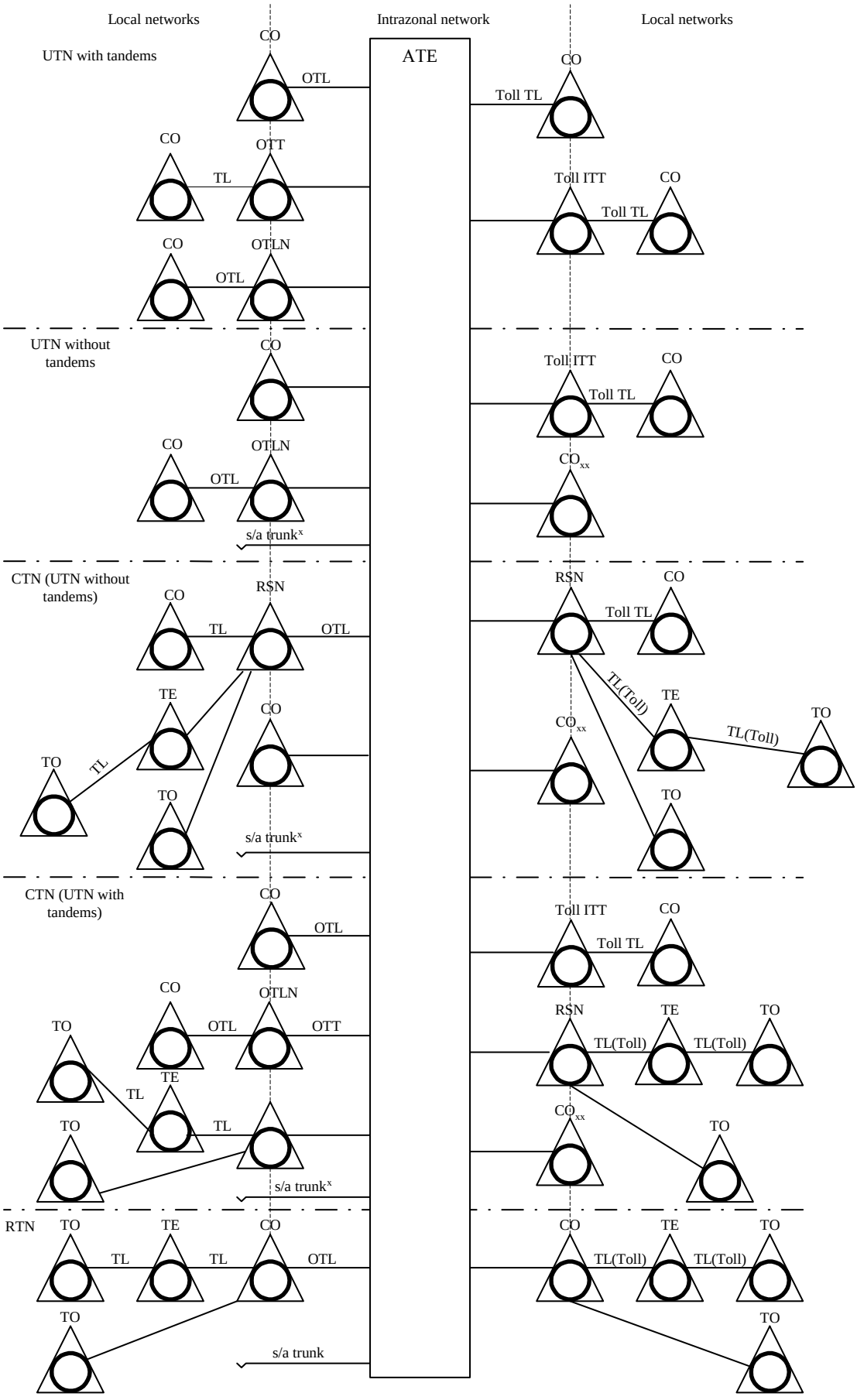


Fig. 3.20. Versions of outgoing and incoming connections at local networks with ATE

3.7.14. Communication of electronic CO with ATE should be organized so, that in future, with introduction of the digital transmission systems at intrazonal and toll networks, the transition to the fully digital network within the boundaries of the country should be provided.

That's why, in those zones, where the electronic ATE are introduced, the installation of electronic ATE should be provided, with which electronic CO are connected via the trunk of digital transmission systems.

It is recommended to establish connections from crossbar (step-by-step, quasi-electronic) CO to electronic ATE via the trunks of digital transmission systems with the installation of the analog-digital convertors at crossbar (step-by-step, quasi-electronic) CO. Trunks of digital transmission systems are also used for communication of electronic CO with the ATE, and analog-digital convertors are installed at ATE. When two or more ATE are installed in the zone, and one of them is the electronic, the outgoing connection from electronic CO should be established only to electronic ATE.

For outgoing connections from electronic CO to ATE (electronic ATE) via common for several CO switching OTL group, the electronic OTT or electronic switching OTLN should be used. The outgoing connections from crossbar (step-by-step, quasi-electronic) CO to ATE also may be established via electronic OTT or via electronic OTLN.

For incoming connections from ATE (electronic ATE) to CO of the same tandem district among which the electronic ones exist, the electronic toll ITT should be installed.

In all versions of outgoing and incoming communication of electronic CO with ATE (electronic ATE) or cross-bar (step-by-step, quasi-electronic) CO with electronic ATE, it is allowed to use frequency division transmission system trunks at separate interexchange stretches. In any case, at the stretch from CO to ATE and from ATE to CO it is allowed not more than one voice frequency transit and not more than one analog-digital transition. Communication of electronic CO with the ATE (electronic ATE) via the two-wire (three-wire) physical circuits is not allowed.

Communication of electronic CO with the switch board rooms of ATE (electronic ATE) via the OTL should be established directly or via the SSN of electronic or existing systems.

When communication is established via the existing SSN, the analog-digital convertors should be installed at these SSN.

3.7.15. Intrazonal telephone network at the second stage of UATS development should be designed in accordance with the principles, stated in the pp. 3.7.1.-3.7.14.

3.7.15.1. When the zone is created, the communication with the ATE via the OTL may be established not from all local networks, but the following have to be organized : automatic access via OTL from ATE to all local networks, and semiautomatic access via the outgoing trunk groups to all ATE from MTE of all district centres.

3.7.15.2. In the regions without ATE or where ATE-IM is already installed for intraregional and incoming toll communication and also for Toll Switch of the region district centre the use of step-by-step transit nodes, installed in the region centre is foreseen. In some cases transit nodes are used for outgoing toll communication from Toll Switch of the district centre provided ATE is installed in the district centre. Outgoing automatic communication from region subscribers via the transit node is not allowed.

3.7.16. Capacity of line and trunk groups of high use at any stretch of intrazonal network should be multiple to the whole number of the transmission system modules, and total capacity of incoming and outgoing trunk and line groups should be expressed as an integer number of modules.

3.8. ARCHITECTURAL PRINCIPLES OF TOLL TELEPHONE NETWORKS

3.8.1. Toll Telephone Network should provide connections between toll automatic telephone exchanges (TATE) of different zones and their access to the international network.

Principle of the territory division is the basis of the toll telephone network structure, this principle is based on the following:

- territory boundaries and the structure of the trunk-line primary network ;
- administrative division of the USSR territory;
- parameters of feasibility.

Toll telephone network territory may include one or several trunk-line primary network territories.

3.8.2. Toll telephone network at perspective of UATS development should have the structure in accordance with the following principles.

3.8.2.1. Toll telephone network should include terminal ATE, transit ASN and trunk groups for their mutual connections (Fig.3.21).

3.8.2.2. The whole country is divided into 12 telephone territories: Each territory has ASN of the I class-ASNI.

Excess and small traffic between ATE of it's own territory, between these ATE and ATE of other territories and also international gateway should pass through ASN I. All ASN I should be connected one to another via trunk groups by principle "each with each".

3.8.2.3. When it is feasible, one or several ASN of the II class may be installed at the territory; ASN II is necessary for closing the excessive and small traffic between several ATE of their own territory.

3.8.2.4. Toll telephone networks have hierarchical structure and the should have two or three hierarchical levels:

- three levels - ATE - ASN II - ASN I;
- two levels - ATE - ASN I.

3.8.2.5. Toll telephone network is designed with the alternative routes, that is to say, with organization of direct routes between ATE on the basis of the high efficiency trunk groups and with forwarding the excess traffic via the alternative routes: IAR and LSR.

All LSR contain trunk groups with high grade of service, that are designed to provide loss probability equal to 0.01.

ALL IAR contain trunk groups of high use and high grade of service.

3.8.2.6. Direct routes between two ATE are organized if there is enough traffic between them.

Traffic which is reasonable to forward via the direct routes, depends on feasibility parameters, which depend on cost of trunks and switching equipment, as well as also use of trunks in the groups of direct and alternative routes. Excessive traffic that was not serviced via direct routes, and also small traffic between ATE, that are not connected by direct routes, is forwarded via the alternative routes. The last alternative route is the LSR.

3.8.2.7. Each ATE should have two host ASNI, for outgoing and incoming connections to each of which it's own LSR is organized.

One of the host ASNI should be it's "own " ASN (ASN I of it's own territory), and the other- "adjacent" ASN (ASN I of one of the adjacent territories).

3.8.2.8. Four LSR are possible for every pair of ATE.

The shortest (economical) - is the optimum LSR, and if the network works in the normal conditions, all excessive traffic from direct and alternative routes and small traffic between two ATE should pass via the optimum LSR. During overloads or damages this traffic should pass via four LSR.

Note: Calculations for toll telephone network are done for normal conditions of it's work.

3.8.2.9. For every outgoing ATE optimum LSR will pass to part of the network ATE through it's own ASN, and to other ATE- via the adjacent ASN.

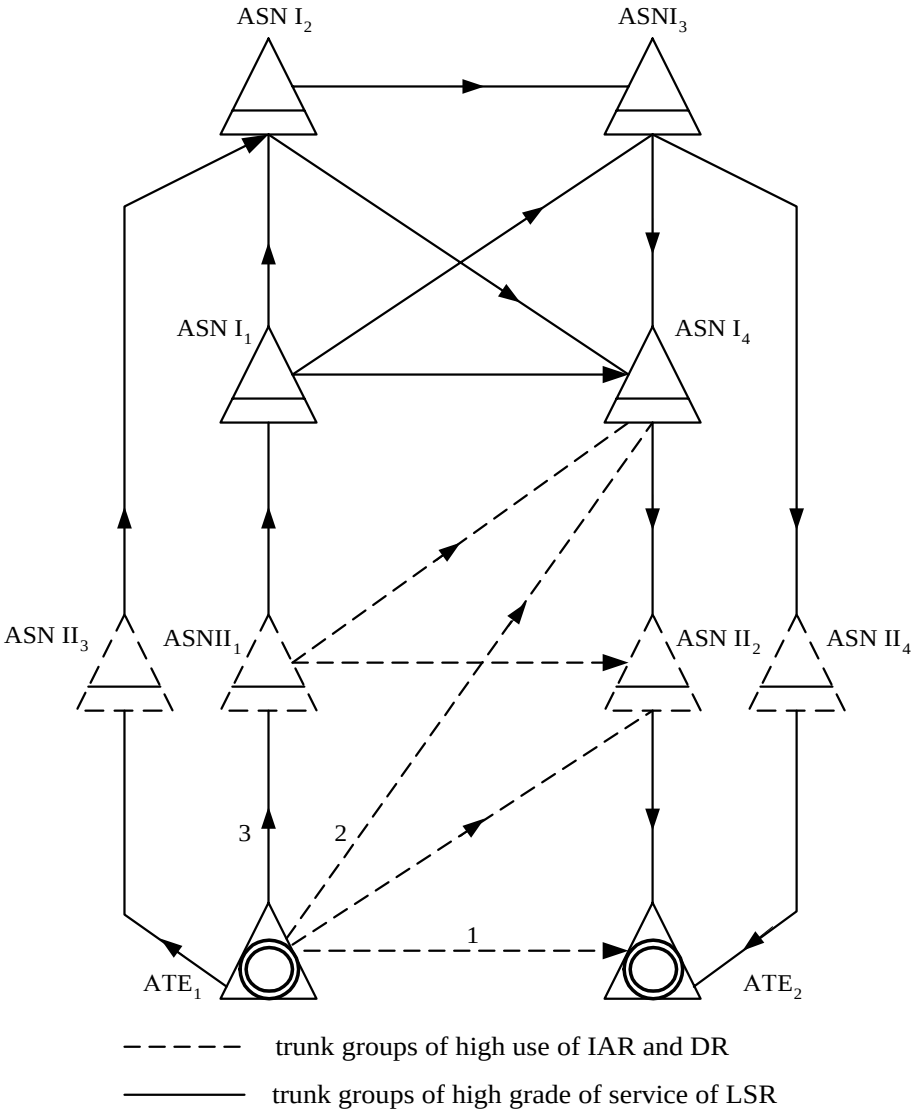


Fig. 3.21. Structure of Toll Network

3.8.2.10. Optimum LSR includes outgoing ASN I, that is host for outgoing and incoming ATE.

Incoming ASN I of the optimum LSR is the ASN that is "strange" for outgoing ATE and IAR group may be organized to this ASN. Optimum LSR may include:

- two ASN I, when two different ASN I are the host for outgoing and incoming ATE;
- one or two ASN I, when outgoing and incoming ATE have one common ASN I;
- one ASN I, when two common ASN I are the host for outgoing and incoming ATE.

The IAR trunk group from outgoing ATE to ASN I is not organized if optimum LSR contains only one ASN I.

3.8.2.11. Toll connections between ATE of different zones, for the case when several exchanges exist within the zone, should pass:

- via direct routes - through one ATE of outgoing zone and through one or two ATE of incoming zone.
- via the alternative routes - only through one ATE of outgoing and incoming zone.

3.8.2.12. When several ATEs located in different cities are installed in the zone, each ATE may have direct routes to other ATEs and alternative routes to other ASNs and should have outgoing and incoming LSR trunk group to it's own and adjacent ASN.

3.8.2.13. When several ATE are located in one city, from the point of view of establishing of direct and alternative route trunk groups, for outgoing toll communication every exchange is the independent ATE, and for incoming toll communication all city exchanges are considered as one exchange.

3.8.2.14. Various routes are possible between two ATE of different territories (Fig.3.21).

Possible routes, when one ATE exists in the zones and ATE are connected via the optimum LSR, are shown below: two level network structure:

DR : ATE1 - ATE2;
IAR: ATE1-ASN I4- ATE2;
LSR: ATE1--ASNI1-ASNI4-ATE2.
For three level network structure
DR: ATE1-ATE2;
IAR: ATE1-ASN II2-ATE2;
IAR: ATE1-ASN II1 - ASN II2 - ATE2;
ATE: ATE1-ASN I4 - ASN II2 - ATE2;
ATE: ATE1-ASN II1 - ASN I4 - ASN II2 - ATE2;
LSR: ATE1-ASN II1 - ASN I1 - ASNI4 - ASN II2- ATE2;

3.8.2.15. To provide needed quality of service for priority calls number of trunks in the group at the LSR stretch between ASN I, ASN I - ATE and total number of LSR trunks from ATE to it's own and adjacent ASN I should be, as a rule, not less than 36.

3.8.2.16. Toll telephone network is designed on the basis of exchanges and nodes with the space switch and of analog trunks of primary network, and also on the basis of electronic exchanges and nodes and digital transmission trunks, that may be used at any part of the network.

3.8.2.17. Trunks between ASN I should be organized on the basis of cable lines via two independent routes of primary network and should not be used as reserve trunks for other networks.

Trunks between ATE, to it's own ASN and ATE, and to adjacent ASN also should be organized via the independent routes.

3.8.2.18. At the network parts ASN - ASN, ASN - system ATE and between system ATE the one frequency signalling system and common channel signalling should be used.

3.8.2.19. Trunks of satellite systems, when it is feasible, may be used for:

- direct routes ATE-ATE;
- alternative routes between ATE and other ASNs, if international traffic doesn't pass through them;
- as an exception, at separate parts of LSR of toll network within one territory (ATE-ASN, ASN-ATE).

In this case incoming IAR groups to ASN of this territory should be organized on the basis of the ground transmission lines.

Two or more stretches of satellite transmission system trunks should not be used in one connection.

3.8.2.20. Development of toll network should be done, in principal, at the expense of creating the new trunk groups increasing the capacity of the direct route trunk groups.

3.8.2.21. Number of switching sectors of LSR should be not more then 5.

Direct routes and every switching sector of LSR and IAR should not have transits via the voice-frequency channels.

3.8.2.22. For organization of trunk groups the primary and more high network groups should be used. That's why total capacity of outgoing and incoming trunk groups at any sector of toll telephone network should be multiple to the module of the transmission system primary group (except satellite trunk groups).

3.8.3. At the second state of UATS development toll telephone network should be based on principles stated in p.3.8.2. The following deviations are allowed (Fig.3.2.2)

3.8.3.1. Before ASN I installation its functions may be carried out by one ATE of the territory, that corresponds to all requirements of UATS.

This exchange may establish transit connections of the toll network trunks, as well as intrazonal, outgoing and incoming toll connections, that is to say, to carry out the functions of terminal transit exchange - TTE I. In future, with the ASN I installation, this ATE will carry out the functions of Terminal offices.

3.8.3.2. Separate territories where ASNI are not installed yet, and the possibility to organize TTE I is absent, must be connected to ASN (TTE) of the adjacent territory, or must be distributed between several adjacent territories. The selection of the version should be done during the design.

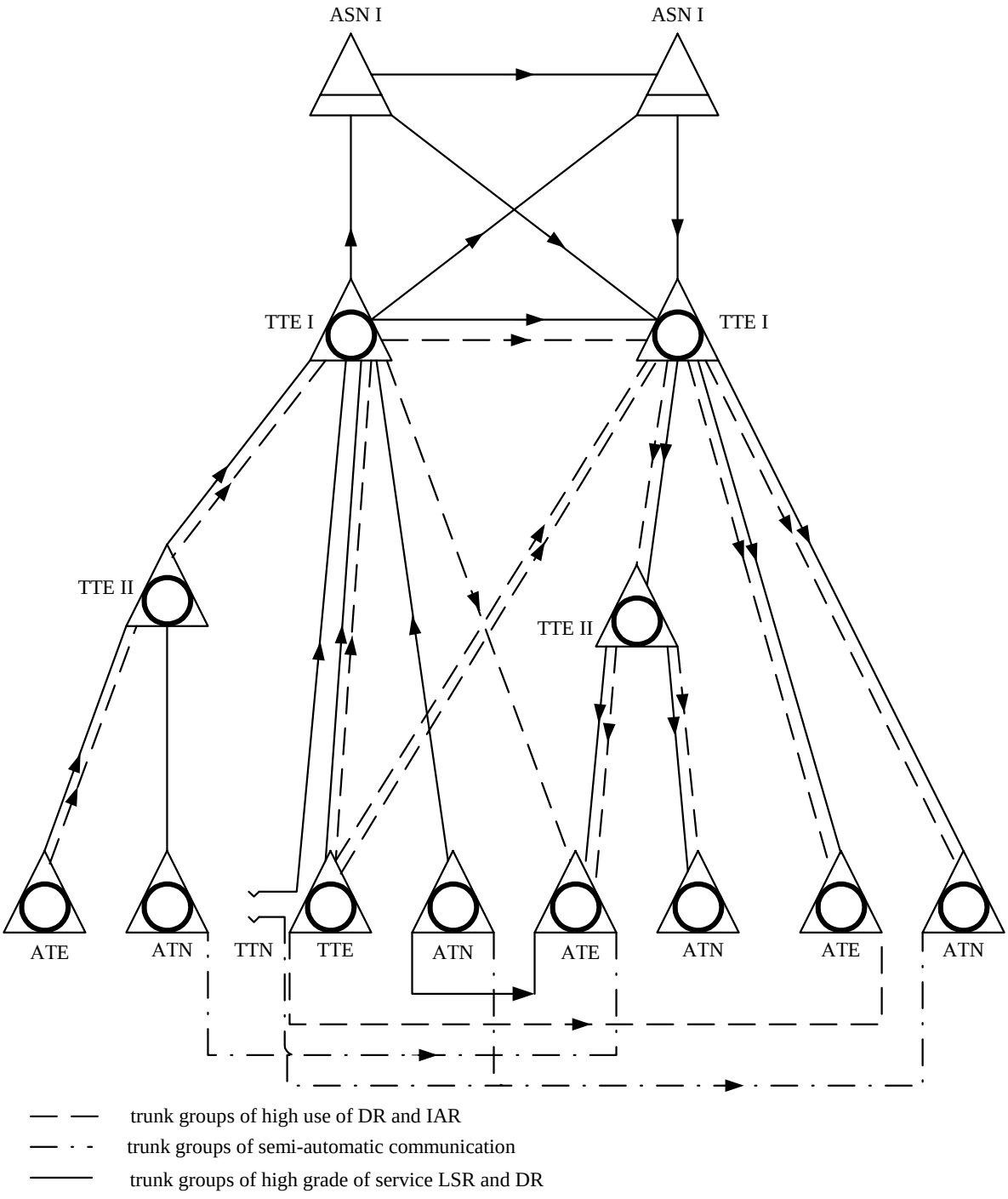


Fig. 3.22. Structure of Toll Network at the second stage

3.8.3.3. In some territories the ATE that are located in the republic capitals, may be used for servicing of the intrarepublic traffic. This ATE, become the TTE II and carry out the functions of ASN II.

3.8.3.4. Automatic transit nodes of the region and TE that have semiautomatic communication equipment may also be used as terminal exchanges.

3.8.3.5. Only one transit node, ASN I or TTE I, may be the host for ATE (MTE).

3.8.3.6. When it is technically possible, two trunk groups for outgoing, as well as for incoming connections may be organized between terminal ATE and TTE and between different TTE:

- first group - DR - for servicing the terminal traffic of ATE - TTE, TTE-ATE, TTE-TTE; and
- second group - LSR or IAR for excess and small transit traffic. For MTE and TTE the above mentioned principles are actual only for incoming communication to MTE.

3.8.3.7. From MTE to the toll network exchanges the DR trunk groups for terminal traffic, without forwarding the excess traffic via alternative routes, may be organized.

Small traffic to the exchanges, to which direct routes are not organized, is forwarded via the transit nodes (ASN, TTE).

3.8.3.8. If it impossible to organize trunk groups between ASN (TTE) only via the cable lines with one frequency signalling system or with common channel signalling system, it is allowed to have two trunk subgroups:

- first subgroup of high use (radio microwave, two frequency)
- second - high grade of service (cable, with one frequency signalling system or CCS).

The capacity of the second subgroup, via which the priority traffic should be transmitted, should be no less than 18-20 trunks.

Note: In some cases the above mentioned can be related to LSR trunk groups ATE-ASN (TTE) and ASN (TTE)-ATE.

3.8.3.9. Direct routes and parts of alternative routes, with the exception of LSR, may have additional transits via the voice frequency channels, taking into account that total number of transits at toll telephone network should not exceed 5.

3.8.4. To provide needed quality of transmission for toll and international communication echo suppressors should be connected to trunks if the time of signal propogation in one direction via the trunk exceeds 50 ms (that corresponds to the distance between terminal ATE equal to 8000 km).

In perspective, at telephone network for communication between any two ATE the probability of electrical echo currents appearance in the trunks should be not more than 1%.

At the second stage of development this value may be 10 %.

3.8.4.1. One echo-suppressor set consists of two subsets (incoming and outgoing), that may be connected to ATE, as well as to ASN (TTE).

3.8.4.2. The necessity of echo suppressors use for each connection is determined at the outgoing ASN (TTE) or at outgoing ATE if this ATE is the stored program controlled one.

This determination is done on the basis of analysis of ABC codes, routes (DR, LSR, IAR) and types of messages. For ASN (TTE) the distance to calling ATE is taken into account.

3.8.4.3. One echo suppressor set should consist of two subsets that, on both ends of the telecommunication channels, are connected to a four wire path at a distance not more than 2000 km from hybrids (that corresponds to the time of detection of the signal in the loop).

3.8.4.4. Echo suppressors are connected to the points with relative output level-13 dB and input level- 4dB or to the points with relative input and output level - 3.5 dB.

3.8.4.5. In ATE echo suppressors are used at outgoing and incoming DR trunk groups, at outgoing IAR groups and at outgoing and incoming LSR trunk groups if the distance to ASN (TTE) is more than 200 km.

In ASN (TTE) echo suppressors are used at outgoing and incoming LSR trunk groups when a distance ASN(TTE) - ASN(TTE) (for at incoming IAR trunk groups if the distance from ASN to incoming ATE via the LSR) is less than 2000 km.

The satellite channels should be equipped with echo suppressors on their both sides.

3.8.4.6. Echo suppressor subsets may be connected to ATE or ASN on a per channel basis or on a per group basis, that provides automatic connection of echo-suppressors to the channel if demanded.

For DR trunk groups, in ATE, the channel-associated pattern of echo-suppressor connection is used.

For LSR and IAR trunk groups in ATE and ASN (TTE) group dedicated and channel-associated patterns of echo-suppressor connection may be used.

Note: For TTE of ATE-5,6-types only channel associated pattern is possible.

3.8.4.7. Channel associated pattern of echo-suppressor connection at LSR and IAR trunk groups is used at ATE and ASN (TTE) it:

a) part of traffic, that requires the switching of echo-suppressors, exceeds 15% of the total group traffic;

b) part of traffic, that requires the switching echo-suppressors, is less than 15% , but exchange (node) equipment does not provide the group-associated pattern of echo-suppressors switch on, or the signal of the switching of echo-suppressors is not transmitted (at incoming groups).

3.8.4.8. Group- associated pattern of echo-suppressoss switching is used in ATE and ASN (TTE) if part of the traffic, that needs echo-suppressors does not exceed 15% of the total traffic of the group and if:

a) ATE (ASN, TTE) has the possibility to switch on the echo-suppressor by group-associated pattern;

b) signal of the echo-suppressor switching is transmitted(for incoming groups).

Notes to pp.3.8.4.7. and 3.8.4.8.

Traffic at ASN, coming from remote ATE at a distance not more than 2000 km, isn't the traffic that needs the switching of echo-suppressors at ASN (TTE).

3.8.4.9. Satellite channels are equipped by echo-suppressors with channel-associated pattern of switching.

3.8.4.10. At nodes and exchanges with stored program control, if connections that do not need echo-suppressors are established, the neutralization of the constantly switched on echo-suppressors should be done.

3.8.4.11. In the channel, as a rule, should be not more than two echo-suppressor subsets. And if transit echo-suppressions are in the channel, they should be neutralized. As an exception, the switching of 3-4 echo-suppressor subsets is allowed.

3.8.4.12. For normal signals transmission during the establishment of connections in exchanges and nodes it is necessary to neutralize echo-suppressors that are constantly switched on in the points with relative output level-13dB and relative input level 4dB.

3.8.4.13. For data transmission it is necessary to neutralize echo-suppressors with the help of the signals, coming from subscriber terminals.

3.9.PRINCIPLES OF AUTOMATIC AND SEMIAUTOMATIC TELEPHONE COMMUNICATION

3.9.1. The automatic and semiautomatic telephone communication should be organized via unified trunk and line groups of toll and intrazonal telephone networks (with the exception of section from local network up to ATE).

3.9.2. Automatic telephone connections at outgoing local network are established via the local network equipment and it is accompanied by the voice signal which is received after the transmission of access index to ATE (ZTN), and at incoming local network it is established via the toll equipment.

Semiautomatic telephone connections at outgoing and incoming local network are established via toll equipment.

In future the possibility of establishing of all types of connections via local communication equipment should be foreseen. Transition to local communication equipment should be done gradually, by separate directions of intrazonal networks.

3.9.3. For semiautomatic toll call, the following advantages are foreseen for operators: the possibility to camp on the calling subscriber line, which is busy by local, intrazonal or toll connection and to listen the conversation, and also the second call sending during the calling subscriber clear-backward (ring-off).

Notes:

1. During the communication via step-by-step (cross-bar) CO, operator can not camp on the subscriber lines, that are busy by toll or intrazonal connections.

2. In quasi-electronic, electronic CO if subscriber is busy by toll, intrazonal or local connection and his telephone-set has the category N8, operator cannot camp on connected up to the such extension.

3.9.4. Establishing of the connection at outgoing ATE should be done after receiving the full number of calling subscriber (special services) from subscribers or operators.

3.9.5. At local networks stored program controlled ex- changes can transmit to subscriber busy by local connection, the tone warning about the new call.

3.9.6. The auxiliary working places are introduced at ATE of the regional centre and MTE of the district centres.

Operators of working places render assistance during the establishment of connections. Access to working places is provided only from operators of other exchanges.

3.9.7. To provide semiautomatic mode of toll and intrazonal connections, subscribers of local networks access ATE and MTE operators via ordered lines, and priority subscriber access ATE operators via ordered trunk lines. Access of subscribers without priority to ATE operators can be established, in some cases, also via OTL.

3.9.8. For toll, international, intrazonal and local calls the automatic method of definition of category and zone number of calling subscriber is used.

Local networks should have ANI equipment or other devices with the same functions.

Organization of automatic intrazonal and toll connections through ATE with subscribers dialing of their own zone numbers is allowed temporarily.

Note: If AMTC-2 and AMTC-3 are installed in some zone, it is allowed to organize automatic toll and intrazonal communication with the method of own zone number dialing for some points of the zone.

3.9.9. Service communication should be foreseen between all ATE and ATE and nodes of toll network and also between ATE and ZTN.

Service communication should be established via service exchanges, installed at all ZTN, ATE, ASN. Service exchanges are connected one to another through the ATE (ZTN, ASN) equipment via ordinary trunks without choosing special lines for this type of communication.

Operation and maintenance personnel are the subscribers of service exchanges. Subscribers of service exchanges have the possibility to establish automatic connections with any subscriber of it's own service ATE and with subscribers of service exchanges of toll network. Communication between PSTN and service exchange subscribers is not foreseen.

Note: Toll exchanges ATE-2 and ATE-3 do not provide automatic communication of service exchange subscribers of different ATE via common toll trunks. Communication of service exchange subscribers of above mentioned ATE types may be established through toll operator or through special trunk network , organized between service ATE.

3.9.10. Subscriber terminals, including data transmission facilities, facsimile facilities and E-mail are connected into local networks via two-wire interface.

3.10. TELEPHONE NETWORK UPGRADING

Telephone network upgrading should provide network design in accordance with the principles stated in the present document, and in accordance with the structure of network development.

3.10.1. Toll telephone network upgrading should be done in accordance with the scheme of development and automatization, designed at 5 and more years. Toll telephone network upgrading is done in two directions: in direction of development of trunk groups between exchanges and nodes and in direction of development of exchanges and nodes.

Development of trunk groups should be done by periods, that are the parts of 5-year plan, i.e. by 1, or 2.5.-year periods.

Exchanges and nodes are installed and extensioned with 5-year stand by of capacity.

For every period of development, design of toll telephone network with definition of the trunk groups capacity at all sections of network (DR, IAR, LSR) and the capacity of exchanges and nodes should be done on the basis of forecas ting traffic.

Design is done on the computer by the method, given in the section 15 of the present document.

In the beginning of every period actual toll telephone network should be brought into accord with designed data.

For upgrading of telephone network in accordance with the periods, primary network in the beginning of every period should ensure the upgrading of trunk groups, whose capacity is planned to the end of period, i.e. primary network should outstrip the development of toll telephone network at the whole period (1,or 2.5-year).

3.10.2. Upgrading of zone telephone networks should be done on the basis of the zone network development schemes.

3.10.3. Introduction of new and extension of existing exchanges and nodes should be done in accordance with the projects, that are designed on the basis of the scheme of toll telephone network automatization and schemes of zone telephone network development.

3.10.4. Introduction of electronic exchanges should be done in a concentrated wanner, and electronic ATE and CO should be concentrated at separate zone networks.

Introduction of electronic switching equipment should be accompanied by corresponding introduction of digital transmission systems.

3.10.5. For upgrading the telephone network, the arrangements, providing the maximum automatization of toll and intrazonal traffic should be done.

4. SERVICES PROVIDED BY THE SYSTEM

Alongside with the basic telephone, faximile, E-mail and data calls handling PSTN should provide also the following services.

4.1. LOCAL NETWORKS SERVICES

4.1.1. Information and ordered services

4.1.1.1. The information and Ordered services are provided by the inquiry-desks and service-desks connected to the telephone network.

4.1.1.2. The inquiry - desks should submit to subscribers an information required either in the form of speech, or, in future, in visual form (e.g. to be displayed on the screen of the conventional TV set).

4.1.1.3. Ordered services shall receive orders for services to be provided from subscribers. The contact via telephone should be finished by the order (service request) registration. This request will be queued for the further procession and fulfillment.

4.1.1.4. The Emergency services are the special kind of the special services. They are devoted to receive urgent requests for the emergency services in extremal conditions (fire, antisocial behaviour, accidents, natural disasters).

4.1.1.5. There are three types of special services connected to the PSTN depending on the technical means used:

- with mandatory operator participation (with the possibility of using the automatic equipment to search, register and transmit to the user information required; autoannouncement;
- Man-Machine Communication (MMC) providing direct dialogue between subscriber and computer.

4.1.1.6. According to their administrative status services can be subdivided into:

- Ministry of communication (MOC) Services
- other enterprises services (non-MOC services).

4.1.1.6.1. MOC services are:

- telephone network inquiry-desk service (provides information about the subscriber directory number using complete or uncomplete data);
- toll and international call book services;
- telegrams registration via telephone (telegraph services);
- telephones repairement requests registration office (repairement office);
- pay-phones repairement requests registration office;
- information about the services provided by MOC (telephone network capabilities, telegraph and postservices, postal codes etc.);
- precise time of the day announcement.

4.1.1.6.2. MOC services staff is employed by MOC. The preparation, updating and reliability of provided information is the field of MOC responsibility.

The fulfillment of the orders is also done by the MOC employees.

4.1.1.6.3. None-MOC services:

- emergency services;
- None-MOC information providers.

Emergency services:

- fire brigade;
- law enforcement officials;
- emergency medicare;
- gas supply network emergency.

Additional emergency services can be provided at some networks (e.g. floods alarm, avalanche alarm).

Ordinary services:

- Information desks:
- address information;
- information about different service providers and industrial enterprises (addresses and working hours);
- information about the repertoire of the show business facilities;
- railway information;
- airways information;
- long distance bus transportation information;
- legal advice.

Autoannouncement services:
- weather forecast;
- road police information;
- goods availability information;
- new published books information;
- tourist information etc.

Orders registration services:
- railway tickets;
- taxi;
- airtickets;
- boat tickets;
- bus tickets etc.

4.1.1.6.4. The non-MOC services are provided by the employees of the enterprises, providing these services. The preparation, updating and reliability of the information is the responsibility of the enterprises mentioned.

4.1.1.7. All the services can enjoy the connection to PSTN only if it is proved that the equipment and staff are sufficient to provide the grade of service complying with the requirements of the part 2.

4.1.1.8. The ANI information detectors should be provided if the calling party number is needed by the service. It is possible to use the call back procedure to check the number as a short term solution.

4.1.2. Additional Features.

4.1.2.1. Stored program controlled (SPC) telephone exchanges should provide additional features to subscribers of both industrial and residential sectors. The possibility to unite the industrial sector subscriber in special groups (affinity groups) should be foreseen to make a Virtual PABX.

4.1.2.2. Some actions should be made by the subscriber using his telephone set in order to get access to additional features.

Telephone set needed to order the access to additional features is the key telephone set with 12 keys. (10 digits, asterisk * and shape #) and additional "R" - key for some purposes. On the initial stage of the additional features introduction it is permitted to use telephone sets with rotary diallers and with or without additional key.

4.1.2.3. Additional features provided for subscribers are:

a) Connection establishment speed-up features:

- abbreviated dialling for all types of connection (*)
- hot-line with the possibility of normal call (*)

b) Information services:

- wake-up call (*)
- connection booked in advance

c) Communication restrictions:

- Ban on the outgoing and incoming calls (except emergency services);
- some types of outgoing calls restriction;
- outgoing call on password;
- selective do-not-disturb, when the calls are permitted only from predetermined subscribers, for a definite time.
- do not disturb for a definite time.

d) Absent subscriber services.

- call redirection to the autoannouncement machine or to the operator (*).
- call redirection;
- call redirection to the extension used to order the service using password;
- paging

e) Busy subscriber service:

- repeated call without dialling (recall) (*);
- call backward after waiting;
- break-in after the warning (the service is provided for the high-priority PABX subscribers to ensure the connection with the subscribers having no access to PSTN);
- redirection of the call to one or several other destinations.

f) Services provided during conversation:

- call redirection to a third party during conversation (*).
- call waiting warning (*);
- calling party number identification.

g) multiparty connections:

- conference call on predetermined list;
- conference with participants to be added one by one;
- three-party conference;
- inquiry during conversation;

h) Other features:

- able, disable or change of personal password.

Notes:

1) The features are introduced in the process of SPC exchanges installation at the network;

2) SPC exchanges should provide the possibility of new features introduction.

3) Some of the features are standard for particular CO, others should be ordered, the list of both types should be defined by the user of the switching equipment.

4) Asterisk (*) marks the features to be provided to any PSTN subscriber (depending on the category of an extension-see item 6.3.); others can be provided only to PABX and affinity groups subscribers for internal calls on the second stage of the unified automatic networks development.

4.1.2.4. Subscriber actions during access to and use of the additional features should be standard all over PSTN taking into account CCITT recommendations. It can be different for different types of terminals. The CEPT recommended procedure should be considered as basic one:

Final definition will take place during SPC exchanges introduction on the network.

4.1.3. Maintenance features:

- seizure of the calls to the subscriber with changed number, to nonexisting destination or to switched-off extension;
- PABX automatic night-service;
- some types of connection or direction restrictions on per extension basis;
- outgoing and incoming calls registration.

4.2. ADDITIONAL SERVICES PROVIDED ON THE TOLL AND INTRAZONAL NETWORKS

4.2.1. The services of the toll and intrazonal telecommunication shall be provided by the equipment of CO and Automatic Toll Office. Among these services are for example toll inquiry-desk facilities (information about toll telephone network, area codes, dialling sequence etc) and abbreviated dialling of the most frequently used directory numbers (supported by SPC CO equipment).

4.2.2. The following local networks services shall be accessible for subscribers of other areas:

- urban network inquiry-desk;
- address information provided;
- weather forecast service;
- road police information.

Access to all other services may be organized depending on demand and local conditions.

4.2.3. Information and inquiry services can be provided to semiautomatic communication users (information about queus to be served, duration and cost of conversation completed, changes in the order etc). The following services can be provided for additional payment:

- conversation with predetermined person;
- call with preliminary notification;
- information about subscriber directory number in other cities.

5. SYSTEM AND PLAN OF NUMBERING

5.1. NUMERATION AT TOLL AND INTRAZONAL TELEPHONE NETWORKS

5.1.1. Every zonal telephone network has it's own 3-digit (ABC) zonal or toll code.

5.1.2. Subscribers of zonal networks should have 7-digit number for zonal communication and 10-digit number for toll communication.

5.1.3. Subscriber's number of zonal network (zonal number) consists of 2-digit local network code or the ab code of 100-thousand subscriber group (intrazonal code) and 5-digit subscriber number in local network or in 100-thousand subscriber group.

5.1.4. Subscriber number of toll network (toll number) consists of 3-digit toll code and 7-digit zonal subscriber number.

5.1.5. In the case of automatic toll communication subscriber should dial:

8 - ABC ab xxxxx;

where 8 - access index to ATE (ZTN)

"__" - dial tone (ATE " answer ");

ABC - toll code;

ab xxxxx - zonal number;

ab - intrazonal code;

xxxxx - subscriber number of local network (local num ber) in case of 5 - digit numbering plan, or last 5 digit of number in case of 6-digit (bxxxxx) and 7-digit (abxxxxx) numbering plan at local networks.

In case of 7-digit numbering plan at local network the local number coincides with the zonal one.

Notes:

1. As "A" any figure, except 1 and 2, and as "B" and "C"- any figure may be used.

2. Figures 8 and 0 mast not be used as first digits of a subscriber number at local networks with 7-, 6-, and 5-digit numbering.

3. Any digit except 8 and 0 may be used as "a", and any digit may be used as "b" but taking into account note 2.

4. "22" is assigned as "ab" to zonal center UTN of local network in case of 5-digit numbering, and "2" is assigned as "a" in the case of 6-digit numbering.

5. If subscriber, in the occasion of local communication, dials index to access UTN or CO, then such index should be dialed in addition to access ATE (ZTN).

6. Temporarily, in the case of 3-,4-digit numbering at local networks, the zonal number is added supplemented to

7-digit number before "ab" (for example 00abxxx).

5.1.6. In the case of automatic zonal telecommunication subscriber should dial:
8-2 abxxxxx, where:

2 - intrazonal index;

abxxxxx - zonal number.

5.1.7. When urban and regional zones are organized in the region, communication between them is organized with the use of following numbering.

Subscriber should dial 8 - 2 abxxx for access from urban to regional zone, and for access from regional to urban - 9 -abxxxxx.

Note: Figures 8,0 as well as 9 cannot be used as first digits of subscriber number of regional zone local networks.

5.1.8. When connections in the region are organized via ATE, then incoming toll communication should be established by dialing standard toll numbers - ABC abxxxxx.

Note: In the case of operation of AMTC - 3 with ATE and when the direct route exists between them, subscriber should dial the number ABC 00xxxxx.

5.1.9. In the case of automatic international communication subscriber should dial the following:

8 - 10 Nint, where

10 - international index of automatic communication.

Nint - international number of called subscriber (up to 12 digits), that consists of the state code Cs (1-3digits) and national number of called subscriber - Nnat.

Notes:

1. Automatic international communication is allowed to subscribers that have ANI equipment.

2. AMTC-2, 3 do not allow to organize automatic international communication.

5.1.10. For UTN subscribers access to ATE (MTE) ordered and information services via ordered lines, the 3 - digit numbering 071-070 should be used (see Table 5.6).

For RTN subscribers and in separate cases for UTN subscribers, access to ordered and information services via ordered lines is provided when dialling 07.

5.1.11. Access of subscribers to ATE services via OTL should take place upon dialing the following:

8 - 11...14,18

Note: Numbers of toll services should be the following:

11,13 - ordered services;

12,14 - reference services;

(15 - spare for international service);

18 - reference information service.

5.1.12. Access of subscribers to the international service (reference and ordered) located at ATE, is as follous:

5.1.12.1. From city subscribers via ordered lines, by dialing 079 number, via OTL by dialing 8-19L number, where

19 - index of international service access.

L - access code to a determined language group, or to other services.

5.1.12.2. From zone subscribers via OTL by dialing 8-19L.

Note: Temporarily it is allowed to dial local number for access to international service.

5.1.13. Access of subscribers to international services, located at international exchange, is done by dialing 8-19L.

5.1.14. Subscribers call to Ministry of Communication and administrative services of the other city UTN and CTN and RTN district centers with local abbreviated numbering of toll and intrazonal networks should be done by dialing the toll and intrazonal numbers.

5.1.14.1. Subscriber's call to UTN services, having 5-or 6-digit number is done by dialing for 2-digit number services at toll network:

8 ABC ab0x 111;

at intrazonal network

8-2 ab0x 111;

for 3-digit number services:

at toll network

8 - ABC ab0xx11;

at intrazonal network

8-2 ab0xx11

where 0x(x) - service local number,

(1) (11) - additional digits to complete zonal number up to the 7 digits.

5.1.14.2. For subscribers calling over toll and intrazonal network to UTN services of the regional center with 5-, 6-or 7-digit numbering the intrazonal code (ab)-99 should be assigned.

5.1.15. Call to the operators of dedicated networks is done by two versions:

First version. Subscriber should dial:

8 - ABC84

where ABC - toll code of the zone where the dedicated network is located.

Second version. Subscriber should dial:

8 - ABC8x

where ABC - toll codes, assigned for access to dedicated networks (ten codes)

8x - 2 - digit number of dedicated network (ten numbers).

Note: In the case of toll connection from PSTN subscribers of AMTC-2, AMTC-3 to subscribers of dedicated networks, calling subscriber should dial 10 - digit number.

5.1.16. For communication with mobile subscribers an intrazonal code "90" is allotted for every zone.

5.1.17. In the case of operation with the subscriber's own number dialing, subscriber, after dialing the toll or zonal number, or operator of dedicated network access code, should dial also his own zonal number.

Note: In this case it is allowed do dial 5-, 6-digit local number if ATE equipment can add digits to complete number up to zonal number, and if there is no integration of OTL groups from CO with different intrazonal "ab" codes.

5.1.18. Access of ATE (MTE) operators to subscribers in the case of toll and intrazonal communication to reference services of UTN and RTN, to operators of dedicated networks, to mobile subscribers is done by dialing same numbers as ones for dialing from subscribers with the exception of access code "8" and to zeroes which should complete the number 7-digit one.

Notes:

1. ATE (MTE) operators, transmitting number from cord switch board telephone - set with pushbutton MF dialing, should additionally dial category of call(Cc)(before the number) and end of dialing (ED).

2. In AMTC- 2,3 Cc is not dialed and processed.

3. In AMTC - 5,6 the category of call is formed in the exchange equipment.

4. In quasi-electronic (electronic) ATE, when electronic switchboards are used, it is appropriative to form Cc in the exchange equipment.

5. Operators, when they work through ATE (MTE), for communication with ATE via DR dial the toll number, where ABC is attendant code to access to district center.

5.1.19. Access of ATE (MTE) operator or district center MTE operator of one zone to working places of regional center of other zones is done by dialing ABC 81 or the number of service exchange, and to working places of district centers by dialing the toll number ABC ab22222.

Note: In separate cases local number may be:xx222, xx292, 22292.

5.1.20. Service communication of CO (ATE) and ASN subscribers is established by dialing:

- for access to subscribers of service CO of ATE of other zones and ASN:

8 - ABC0x1xx(x), where

ABC - zone code where the service CO is located, or ASN code;

0 - access index to service CO

x1 - number of service ATE in the zone (digits 1-5 are assigned).

xxx or x1xx - number of service CO subscriber.

- for access to subscribers of service CO of the other ATE of the own zone:

8 - 2 0x1xx(x)

For operators access to service CO subscribers the "8" index should not be dialed.

Note: For toll and intrazonal communication 2-digit numbering of service CO subscribers is not allowed (without x1).

5.1.21. For communication with subscribers of the system that is allotted for service, the following number is transmitted via the toll network:

ABC 0x1xxx, where

ABC - toll code of the zone

x1xxx - subscriber number in the zone. Digits 6-0 are allotted for x1.

In separate cases access to the above mentioned subscribers is done by dialing:

ABC x0xxxx, where

ABC - allotted toll codes

x0xxxx - subscriber number in the zone. Any digits except "8" are used as x0.

Access to operators of the system is done by dialing ABC 80.

5.1.22. For special services called via toll or intrazonal network, the individual code of local network ("ab") - 98 is allotted in every zone.

Subscribers of these services have 5-digit local numbers, and this call is done by dialing.

via toll network:

8 - ABC 98 xxxxx;

via intrazonal network:

8 - 2 98 xxxxx.

5.1.23. Call to incoming working places of international service located at the ATE from operators of international exchanges of this country and from other countries is done by dialing ABC 82, where ABC - code of the zone, where international service is located.

For zones, where two international services are organized, it is necessary to allot additional international code ABC for access to second international service.

Note: For access to AMTC - 2,3 and MTE international services, the international exchange should translate received ABC 82 number into the service CO number: ABC 0x1 82(10x1 82) and ABC 0x1 x 82).

5.1.24. Access to order desks of ATE international service from ATE (MTE) operators of the other zones is done by dialing the number of service ATE - ABC 0x1 34.

5.1.25. Access of operator of ATE international service to subscribers of international network should be done by dialing.

at AMTC - 5-10	Cc 10 Nint Ed;
at AMTC - 3	ABC* - 10Nint;
at MTE via semiautomatic trunks via DR	1 - 10 Nint,

where ABC* - toll code of international exchange;
Cc - call category.

5.1.26. Access of operator of ATE international service to operator of international exchange of our country should be done by dialing:

at AMTC - 5-10	Cc 19L Ed;
at AMTC - 2	ABC* - 19L;
at AMTC - 3	ABC* - 19L;
at MTE via s/a trunks via DR	1 - 19L

5.1.27. Access of operator of AMTC international service to operators of the other countries is done by dialing:

at AMTC - 5-10	Cc 15 Cco L81 (82,83xxx)Ed;
at AMTC - 3	ABC* - 15 Cco L81(82,83xxx);
at MTE via s/a trunks via DR	1-15 CcoL 81 (82,83xxx), where

15 - 2-digit access code to international operator of the other country;

81, 82 - access code to operators, having code 11 (incoming, immediate system) are having of code 12 (delayed connections).

83xxx - number access out to special operator working place of 12 code.

Cco - code of the country of destination.

5.1.28. Codes of an access to the operator of telephone network administration system to administration centers are as follows.

5.1.28.1. To the main administration center:

for call to receiving and transmitting device - Cc300 Ed;

for call to operator - Cc ABC 0x1 238 Ed;

where ABC - 095.

5.1.28.2. To the territory administration and control centers:

for call to receiving and transmitting device - Cc ABC

Ed (from operator of zonal administration center at AMTC - 5-10 and from MACTN) and ABC 83 (from AMTC - 2,3 operator);

for call to operator - Cc ABC 0x1 238 Ed (from operator of zonal administration) center at ATE - 5-10 and from MACTN) and ABC 0x1 238 (from operator of ATE - 2,3),

where ABC - ASN code.

5.1.28.3. To zonal administration center:

for call to receiving and transmitting devices of zonal administration center, connected to AMTC -5-10- Cc ABC 83 Ed

(from operator at AMTC - 5-10) and ABC 83 (from operator at AMTC - 2,3);

For call to receiving and transmitting devices of zonal administration center, connected to AMTC - 2,3 - Cc ABC 0x1 239 Ed (from operator at AMTC - 5-10) and ABC 0 x1 239 (from operator at AMTC - 2,3)< where ABC - code of the zone.

5.1.28.4. To ATE administration stations: for call to receiving and transmitting devices - Cc ABC 0 x1 151 Ed;

for call to operator - Cc ABC 0 x1 156 Ed, where ABC - code of the zone.

5.1.29. In every zone numbers ABC 85-88 are reserved.

5.1.30. For access to country international exchanges via toll trunks of national network, ABC codes are allotted to all international exchanges.

5.1.31. ABC codes are allotted to all ASN I.

Note: Figure - 80 of this codes and X1, equal to 7 in the numbers of service CO are used for system, allotted for service.

5.1.32. Toll numbering plan

ZONES AND OBJECTS NAMES	ZONES AND OBJECTS TOLL CODES (ABC)
Azerbaijanian SSR	
Azerbaijanian (Baky)	892
Nagorni-Karabakh (Stepanakert)	893
Nakhichevan	891
Kirovobad	895
Armenian SSR	
Armenian (Erevan)	885
	886
Byelorussian SSR	
Brest	016
Vitebsk	021
Gomel	023
Grodno	015
Minsk	017
Mogilev	022
Georgian SSR	
Abkhazia (Syskhymi)	881
Adjarskaya (Batymi)	882
Georgian (Tbillisy)	883
South-Osetiya (Ckhinvaly)	884
Kutaisy	888
Kazakh SSR	
Aktubinsk	313
Alma-Ata	327
East-Kazakh (Ust-Kamenogorsk)	323
Guriev	312
Djambule	326
Djezkargan	310
Karaganda	310
Kzyl-Orda	324
Kokchetav	316
Kustanai	314
Magyshlak (Shevchenko)	329
Pavlodar	318

North Kazakh (Petropavlovsk) 315
Simipalatinsk 322
Taldy-Kurgan 328
Turgayskaya (Arkalyk) 330
Uralshaya 311
Celinograd 317
Chikment 325

Kirgiz SSR

Issyk-Kule (Prdjevalsk) 319
Naryn 335
Osh 332
Frunze 331
Talasskaya 334

Latvian SSR

Latvian (Riga) 013

Lithuanian SSR

Lithuanian (Vilnus) 012

Moldavian SSR

Moldavian (Kishinev) 042

Russian Federation

Adygeyskaya (Maikop) 877
Altayskaya (Barnaule) 385
Gorno-Altayskkaya 388
Amurskaya (Blogoveschensk) 416
Arkhangelsk 818
819
Astrakhan 851
Bashkirskaya (Ufa) 347
348
Byelgorod 072
Bryansk 083
Buryatskaya (Ulan-Ude) 301
Vladimir 092
Volgograd 844
Vologda 817

Tatjik SSR

Turkmen SSR

Uzbek SSR

Ukrain SSR

Kiev _____ 044

_____ 045

Kirovograd _____ 052

Kreamskaya (Symferopol) _____ 065

Lvov _____ 032

Nikolaev _____ 051

Odessa _____ 048

Poltava _____ 053

Rovno _____ 036

Cumy _____ 054

Ternopol _____ 035

Kharov _____ 057

Kherson _____ 055

Khmelnick _____ 038

Cherkassy _____ 047

Chernigov _____ 046

Chenovcy _____ 037

Estonian SSR

Estonian (Tallinn) _____ 014

International exchanges 020, 030, 050, 070, 080, 090, 320, 350, 380, 420, 430, 460, 820, 830, 850, 860, 880

International service:

c. Naberedjnye Chelny _____ 855

c. Tolyatty _____ 848

c. Sochy _____ 862

c. Yalta _____ 060

Main administration centre of toll network (MACTN) _____ 300

Automatic switching nodes ASN I _____ 010, 040, 059, 089, 338, 357, 368, 389, 393, 810, 840, 869,

Dedicated networks _____ 451-450

Exchanges of the system, separated for service	018, 058, 077, 097, 098, 333, 349, 359, 396, 387, 425, 438, 832, 852, 853, 854, 870, 894
ATE and ASN test-control equipment	441-440
Long distance exchanges of satellite communication with sea Vessels	441-440

5.2. Urban Telephone Networks. Numeration Pluns

5.2.1. At UTN, depending on it's capacity, closed 5-, 6- or 7-digit numbering should be used. 5-digit numbering is used at non-districtive UTN and at districtive UTN without tandems, 6-digit numbering is used at UTN with ITT, 7-digit - at UTN with ITT and OTT.

Number of digits depends on the rate of using of network numbering capacity,that constitutes 40-50% at nearest 10 years and 60-80% - at perspective because of increasing of this rate by program resources in the CO of perspective systems.

All digits except 0 and 8 may be used as first ones of UTN subscriber number.

5.2.2. UTN subscriber's number is formed out of 4-digit subscriber number inside the 10-thousand group and of digit and digit combination, added before it that defines the number of his 10-thousand group in the network.

5.2.3. Closed mixed numbering may be used at UTN; it is used when subscribers with different number of digits exist at the network at the same time. Use of such numbering is allowed only when it is feasible, zonal numbers of all subscribers should have equal number of digits.

Zonal numbers of UTN subscribers of zonal center with mixed 5-6-digit numbering should have the following form:

22X'XXXX - for 5-digit subscriber numbers, 2BXXXXX (B=/2, 8, 0, X') - for 6-digit subscriber numbers; and for 6-7-digit mixed numbering the following form:

2B'XXXXX - for 6-digit subscriber numbers ABXXXXX (A=/2,8,0,B') - for 7-digit ones.

5.2.4. There are two possible versions of suburban subscriber numbering. If suburban network is part of UTN, then suburban subscriber numbering is similar to UTN subscriber numbering. When suburban network is connected into UTN similar to PBX connection (see p.3.4.8), then abbreviated numbering (compared to urban) is allowed at suburban network. Incoming communication from urban to suburban subscribers is established by dialing the full

UTN subscriber number, that includes the abbreviated suburban number of calling subscriber as last digits of full UTN number. Outgoing communication from suburban subscribers with abbreviated numbering to urban subscribers is established by dialing the special access code to UTN (digit "9") with further dialing of the full UTN subscriber number. Abbreviated numbers of suburban subscribers cannot start from digits 9 and 0.

5.3. Rural Telephone Networks. Numeration Plan

5.3.1. The following numeration types may be used at RTN, taking into account the technical possibilities of CO of various types and conditions of their use: closed 5-digit numeration, opened numeration without access code and opened numbering with access index. The first two types of numbering are the perspective ones. It is necessary to take into account that the efficiency of numeration capacity use at RTN is 30-40% during the first 10 years to come with the increase up to 50-60% using the resources of the modern CO.

5.3.2. In the case of closed numeration the inter - and intraexchange connections, including those, established via direct and alternative routes from any exchange, independently of it's application at network, are done by dialing 5-digit number of called subscriber. Use of the closed numeration is possible at CO with 5 - digit registers (ATCK-100/2000, ATCK-50/200M) and at CO with program control.

5.3.3. In the case of opened numeration without access index, the establishment of intraexchange (intratandem) communication is provided by dialing the abbreviated 3-digit number, and of interexchange (intertandem) - by dialing the 5-digit number. This numbering is more preferable than closed numeration at RTN with large number of terminal and transit exchanges of small capacity (50-200 numbers), where the intraexchange (intratandem) traffic considerably exceeds the interexchange (intratandem) traffic. Opened numeration without access code may be used when terminal and transit exchanges have 5-digit registers or with stored program control exists at the network. The above mentioned numeration is given in the Table 5.1.

Table 5.1. Opened numeration without access code.

Calling subscriber	Tandem Exchange Type	Numbering				
		subscribers of their own exchange	subscrib. of CO and other exchanges via CO	subscrib. of terminal and tandem exchanges of their own tandem district	district centre services with abbrev numbers	Zone ATE
1	2	3	4	5	6	7
CO of all types	-	cxxxx	cxxxx	cxxxx	0x(x)	8
Terminal exch.: АТСК-100/2000 50/200М, ИАТСКЭ, АТСКЭ-С	-	dxx	cxxxx	-	0x(x)	8
Terminal exch.: АТСК-100/2000	АТСК-100/2000					
50/200М, ИАТСКЭ, АТСКЭ-С	ИАТСКЭ1, АТСКЭ-С	dxx	cxxxx	cxxxx or dxx	0x(x)	8
Tandem exchange: АТСК-100/2000, ИАТСКЭ1, АТСКЭ-С	-	dxx	cxxxx	cxxxx or dxx	0x(x)	8
Operator of district centre МТЕ	--	--	cxxxx	-	-	-

Notes:

1. x - any digit, c - first digit of 5-digit numbers, d - first digit of intraexchange (intratandem) abbreviated numbers.

2. Digits, used as "d", may not be used as "c"; "8" and "0" may not be used as "c" and "d".

3. Digits, shown in brackets may lack (are not mandatory).

5.3.4. Before transfer at closed or at opened numbering without access index it is allowed to use at RTN opened numbering with access index. Such numbering may be used at RTN, that are equipped by any types of existing exchanges, except tandem АТС-50/100, that does not provide unified interexchange 5-digit numbering.

Opened numeration with access code is characterized by the following:

- intraexchange numeration of terminal and transit exchange subscribers is abbreviated: 2-, 3-digit-at exchanges with the capacity up to 800 numbers and 5-digit-at exchanges with more than 800 subscribers capacity;

- intraexchange numbering of CO subscribers in any case is the 5-digit one;

- interexchange numbering in the case of connection to CO and via CO to the other exchanges of the network is the 5-digit one;

- interexchange numbering in the case of communication within the boundaries of it's own tandem district - is the 3-5-digit, and depends on the tandem type.

Versions of opened numbering with access index, that may be used at RTN, are given in Table 5.2.

5.3.5. In the case when direct route (passing over ATE and ZTN) is established between two exchanges of different RTN, for communication via this route the special access code composed from the digits, that are not used for subscriber numbering, is allotted. If it possible it should consist from one digit for subscriber it is allowed to hear the second dial tone before dialing the local number of called subscriber.

5.4. Combined Telephone Networks. Numbering Plun.

5.4.1. When RTN is connected to UTN without tandems (with 5-digit numbering at UTN), the following versions of numbering may be used depending on specific conditions.

5.4.1.1. The 5-digit numbering is used if numbering capacity of combined network, according to general plan of it's development, does not exceed 80 000 subscribers. Numbering, associated with this version is given in Table 5.3.

5.4.1.2. The 6-digit numbering should be used at this network if numbering capacity of combined network exceeds at perspective 80000 numbers. When it is feasible, it is allowed to use mixed 5-6-digit numbering, 5-digit for UTN subscribers and 6-digit for RTN subscribers. Numbering corresponding to this version is given in Table 5.4.

Note: When using the mixed numbering, the zonal numbers of all subscribers should have equal number of digits. It is recommended to add digit "2" before 5-digit numbers, and CTN with mixed numbering, located in one zone, should have different "a".

5.4.2. When CTN in connected to UTN with tandems (6- or 7-digit numbering), CTN have the same with UTN number of digits just 100 thousand numbers are extracted from UTN for RTN subscribers.

CTN 6- and 7-digit numbering is given in Table 5.5.

Table 5.2. Opened numbering with access index

Calling subscriber	Tandem Exchange Type	Numbering				
		subscribers of their own exchange	subscrib. of CO and other exchanges via CO	subscrib. of terminal and tandem exchanges of their own tandem district	district centre services with abbrev numbers	Zone ATE
CO of all types	-	cxxxx	cxxxx	cxxxx	0x(x)	8
Term. exchanges of all types except АТСК-100/2000, 50/200М, ИАТСКЭ, АТСКЭ-С, connected directey into CO of any type	-	(x)xx	9xxxxx	9xxxxx	90x(x)	
Term. exchanges: АТСК-100/2000, 50/200М, ИАТСКЭ, АТСКЭ-С, connected directly into CO of any type	-	xxxxx or dxx	xxxxx	-	0x(x)	8
Term. exchanges of all types except АТСК-100/2000, 50/200М, ИАТСКЭ, АТСКЭ-С	АТСК-100/2000, 50/200М, ИАТСКЭ, АТСКЭ-С	(x)xx	9xxxxx	9xxxxx	90x(x)	98
Term. exchanges: АТСК-100/2000, 50/20, ИАТСКЭ, АТСКЭ-С	АТСК-100/2000, 50/200М, АТСКЭ-С	xxxxx or dxx	xxxxx	xxxxx or dxx	0x(x)	8
Tandem exchange АТСК-50/200 С	-	(x)xx	9xxxxx	9xxxxx	90x(x)	98
Tandem exchange: АТСК-100/2000, ИАТСКЭ, АТСКЭ-С	-	xxxxx or dxx	xxxxx	xxxxx or dxx	0x(x)	8
Operator of dis trict centre МТЕ (working place)	-	-	xxxxx	-	-	-

Notes:

1. dxx - abbreviated subscriber number of CO and transit exchange.

2. Digits that are used as first ones in the 5-digit inter exchange numbers can not be used as "d".

3. Digits, shown in brackets are not mandatory.

Table 5.3. Numbering at CTN with the capacity up to 80 thousand numbers

Calling subscriber	Numbering				
	subscribers of their own exchange	subscrib. of tand. and terminal exchanges of their own tandem district	subscrib. of UTN, RTN via RSN (CO)	UTN services with abbreviat. numbers	ATE
1.Tandem exch. and CO: 100/2000, 50/200M, ИАТСКЭ, АТСКЭ-С	xxxxx	xxxxx	xxxxx	0x(x)	8
2.Tandem exchange: АТСК-40/80, 50/200	(x)xx	9xxxxx	9(-)xxxxx	90(-) 0x(x)	9(-)8
3.Terminal exchanges of all types except ones pointed in p.1: Term. exch., connected to RSN (CO) ИАТСКЭ, АТСК-С	(x)xx	-		90(-) 0x(x)	9(-)8
4.Term. exch., connected to cross-bar transit excheng, ИАТСКЭ, АТСК-С	(x)xx	9xxxxx	9(-)xxxxx	90(-) 0x(x)	9(-)8
4. UTN	xxxxx	-	xxxxxx	0x(x)	8
5. MTE operator	-	-	xxxxx	-	-

Notes:

1. After dialing the access index "9" it is allowed to hear dial tone, transmitted from RSN or CO (in the table it is (-) between corresponding number digits).

2. Digits, shown in brackets are optional. Symbol "-" in brackets means that dial tone is not mandatory.

Table 5.4. Numbering at CTN without tandems at UTN and total capacity, exceeding 80 thousand numbers

Calling subscriber	Numbering					
	subscribers of their own exchange	subscrib. of tandem and terminal exchanges of their own tandem district	RTN subscribers	UTN subscribers	UTN services with abbreviat numbers	ATE
1.Tandem exch. and term. exch. connected directly into RSN (CO): Tandem and term. exch. АТСК-100/2000, 50/200М УС and ОС ИАТСКЭ, АТСКЭ-С	(xx)xxx вxxxxx or (xx) xxx	(xx)xxx вxxxxx or (x) xxx	0(-) вxxxxx вxxxxx or (x) xxx	0(-)(в) xxxxx вxxxxx or (x) xxx	0(-) 0x(x) 0x(x) or 00x(x)	0(-)8 8 or 08
1.Tandem exch.: АТСК-40/80, 50/200	(x)xx	9xxxxx	0(-) вxxxxx	0(-) (в)xxxxx	0(-) 0x(x)	0(-)8
3.Term. exch. of all types except ones, pointed in p.1:						
Term. exch., connected to RSN(CO)	(x)xx	-	0(-)вxxxxx	0(-) (в) xxxxx	0(-) 0x(x)	0(-)8
Term. exch., connected to crossbar tandem exchang., ИАТСКЭ, АТСК-С	(x)xx	9(xx)xxxx	0(-)вxxxxx	0(-) (в) xxxxx	0(-) 0x(x)	0(-)8
4. UTN	(в)xxxxx	-	вxxxxxx	(в)xxxxxx	0x(x)	8
5. MTE operator	-	-	вxxxxx	(в)xxxxxx	-	-

Notes:

1. After dialing "0" index it is allowed for subscribers of electromechanical tandem and terminal exchanges to hear dial tone that is transmitted into RSN; subscribers of quasi-electronic exchanges and quasi-electronic exchanges tandem and terminal exchanges can not hear dial tone.

2. "b" - digit that used as the first one of 6-digit number of rural subscriber.

3. Digits, shown in brackets are optional symbol "-" in brackets means that dial tone is not mandatory.

Table 5.5. CTN numbering with tandems at UTN.

Calling subscriber	Numbering					
	subscribers of their own exchange	subscrib. of tandem and terminal exch. of their own tandem district	subscrib. of RTN via RSN	subscribers of UTN	UTN services with abbreviat numbers	ATE
1.Tandem exch. and term. exch. connected directly into RSN: АТСК-100/2000 and 50/200М ИАТСКЭ and АТСКЭ-С	xxx (xx) (x)bxxxxx or xxx (xx)	xxx (xx) (x)bxxxxx or xxx (x)	0(-) (x)bxxxx (x)bxxxxx or 0(x)bx xxx	0(-)(b) xxxxxx bxxxxx or (x) xxx	0(-) 0x(x) 0x(x) or 00x(x)	0(-)8 8 or 08
2.Tandem exch.: АТСК-40/80, 50/200	xx (x)	9xxx(x)	0(-) bxxxxx	0(-) (x)xxxxx	0(-) 0x(x)	0(-)8
3.Term. exch. of all types except ones, pointed in p.1:						
Term. exch., connec-ted directory into RSN	xx (x)	-	0(-)bxxxxx	0(-) xxxxxx	0(-) 0x(x)	0(-)8
Term. exch., connected to crossbar tandem exchang.,	xx (x)	9 xxx (xx)	0(-)bxxxxx	0(-)xxxxxx	0(-) 0x(x)	0(-)8
Term. exch., connec-ted to ИАТСКЭ and АТСКЭ-С tandem exch/	xx(x)	9xxx(x) or 0(x)bxxxxx	0(-) (x) bxxxxx	0(-)xxxxxx	0(-) 0x(x)	0(-)8
4. UTN	(b)xxxxxx	-	bxxxxx	(b)xxxxx	0x(x)	8
5. MTE operator	-	-	bxxxxx	(b)xxxxx	-	-

Notes: 1. After dialing "0" index for subscribers of electromechanical tandem and terminal exchanges it is allowed to hear dial tone, transmitted from RSN: subscribers of ИАТСКЭ and АТСКЭ-С tandem and terminal exchanges can'nt hear dial tone.

2. "b"-digit that is used as a first one of 6-digit num ber or as a second one of 7-digit number of rural subscriber.

3. Digits, shown in brackets are optional, symbol "-" in brackets means that dial tone is not mandatory.

5.5. Numbering of reference and ordered services at local networks.

5.5.1. Communication of local subscribers with reference and ordered services is provided by dialing the abbreviated 2-, 3-digit number, the ordinary subscriber number.

Abbreviated numbers are assigned to emergency services and also to some reference and ordered services that are popular.

Subscriber numbers are assigned to the services that are characterized by limited or local use (reference services of hospitals, clinics, different enterprises; ordered services of repair offices and etc.). In exceptional cases subscriber numbers may be temporary assigned to individual department services, for which the abbreviated numbers are stated in this document, however, in future such services should use the abbreviated numbering. It is allowed to use subscriber numbers to provide terminal and transit exchange subscribers access to the emergency services, connected into this exchanges.

Notes: 1. It is possible to have an access to the services with abbreviated dialing from subscriber telephone-sets, ordinary pay-phones and special reference pay-phones. It is possible to have an access to the services, having subscriber numbers, from subscriber's telephone-set and from ordinary pay-phones.

2. Services with subscriber numbers, depending on the traffic, may be connected to the network as one extension line, as several lines with continuous hunting groups, as one hundred, one thousand or 10 thousand subscribers group.

5.5.2. Emergency service at local networks should have the following two-digit numbers:

- fire brigade - 01
- law enforcement officials - 02
- emergency medicare - 03
- gas supply network emergency - 04.

5.5.3. Numbers, allotted for Ministry of communication services are shown in Table 5.6

Ministry of communication services numbering

Table 5.6.

Name of services	Numbering	
	Networks with 2-digit services - 0x	Networks with 3-digit services-0x(x)
1. Information about the directory number, using full subscriber data	09	09
2. The same using non-complete data	09	009
3. ATE(MTE) ordered services	07	071, 073
4. ATE(MTE) reference-information service	07	070
5. ATE(MTE) reference services	07	072, 074
6. Reserve for development	-	075 - 078
7. International ordered and information service	-	079
8. Service of telset telegrams order	06	066
9. Centralized service of pay-phones repair	00	064
10. Reference service about the services provided by Ministry of telecommunication	-	069
11. Time service		

5.4.4. Numbers, allotted for department services are given in the Table 5.7

Department services numeration

Table 5.7

Name of services	Numbering - 0xx
1. Tourist service	000
2. Weather forecast	001
3. Road inspection service (motoway and traffic control)	002
4. Long distance bus transportation information	004
5. Railways information	005
6. Airways information	006
7. Waterways information	007
8. Orders fulfilment Orders registration services:	
9. Bus tickets	054
10. Railway tickets	055
11. Wataway tickets	057
12. Taxi	058
13. Information about the city inhabitants and about the other cities	061
14. Show-business information	062
15. Information about the consumer services, city traffic, enterprises adresses	063
16. Reserved	003, 051-053, 059, 065, 067, 068, 080-089

If it is necessary to introduce new department services, not stated in the table, than it is possible to use reserved, 3-digit abbreviated numbers.

5.5.5.1. To simplify the subscribers access to the nearest branch office of the militia, the following number should be reserved at all CO:

5-digit numbering - x0202;

6-digit numbering - xx0202;

7-digit numbering - xxx0202,

were x(xx) - is corresponding CO prefix

5.5.5.2. For free-of-charge official talks of the Ministry of Internal Affairs staff from pay-phones, the 052 number is allotted.

Note: This proposal is realized when the corresponding equipment is used.

5.6. Numbers, used for connecting the test equipment

5.6.1. For access to test equipment of ATE and ASN via toll network the following toll codes are used:

440 - for Busy tone transmission control for outgoing exchanges (nodes) test by automatic test equipment;

441 - for access to incoming device working under (АПКА) program;

442 - for access to response devices, working under (АТМЕ) program;

443 - for access to test equipment, working under (АКИАЭ) program;

449 - for access to response device if testing the line signalling at АМТС 7-10.

5.6.2. Access to ATE answering device via OTL when executing the test calls is done by 2-digit number - 16.

5.6.3. Access to ATE answering device via OTL during performing the control calls is done by 2-digit number - 17.

5.6.4. During execution the test calls via toll TL, access to CO answering device is done by number abxx117.

5.6.5. For performance the control calls at UTN and RTN CO the test numbers abxxx99 are allotted out of calculation one number at one hundred subscriber group.

At RTN transit and terminal exchanges number 39 of every subscriber group should be used for the same purposes.

5.6.6. At every CO of the network one or several numbers are assigned to perform test calls. Within one network these digits have the same view (abxx217 or abxxx47), differ, if it necessary, by thousand digit. It is appropriate to have evidence numbers with continuous hunting. Above mentioned numbers are used for autoresponders switching (numbers of which may be from 2 to 5, depending on number of test equipment at the network).

Note: At small CO it is allowed to use abxxx99 number for test calls performance. In this case the simultaneous performance of test and control calls should be eliminated.

5.6.7. During the ATE tests performance access to the response part of the test equipment via trunks should be done by dialing ABC 89.

5.7. Additional services numbering

Procedure of additional services control from the push-button telset (order, cancelation, services test) have the following form:

Start index	Code	Additional information	End index

Buttons "*" and "#" are used as a start index, "*" - is the character of the service order, "#" - is the character of service cancelation, and their combination is the character of the service test. Button "#" is used as the end index.

2-digit numbers, with 2, 3, 4, 5 as a first digit are used as a service code (see Table 5.8.). Service "abbreviated dialing" is executed by two-time pressing of "*" button and by dialing of 1- or 2-digit abbreviated number; it is allowed to use this service at first by dialing abbreviated number and then by pressing the "#" button.

Additional information includes password, full or abbreviated numbers and etc. Additional information is separated by characters of "*" button.

Additional services codes

Table 5.8

N	Services name	Code	Notes
1	Re_adressing	21	
2	Transfer of the call in the case when subscriber is busy	22	
3	Transfer of the call to the autoresponder or operator	23	
4	Accompanying call on password	24	
5	Searching signalling	25	
6	Waiting with the reversecall	26	
7	Repeated call without dialing	27	
8	Preliminary ordered connection with the subscriber	28	
9	Activation replacement or cancelation of personal password	29, 30	
10	Barring of some types of outgoing connections	31	
11	Call forward (toll) using the password	32	
12	Temporary selective restiction of incoming connections	33	
13	Incoming and outgoing connections barring	34	
14	Temporary barring of incoming connections	35	
15	Call diversion (to the other subscriber)	40	It is allowed to use this service without access code, by depression of "R" pushbutton and dialing digit "4"
16	Conference according to the list	41	
17	Conference with sequential call of the participants	42	
18	Announcement about the new call	43	
19	Three-party conference	44	It is allowed to use this service without code but by depressi on of "R" push-button and by dialing digit "3"
20	Inquiry during the conversation	45	It is alloved to un this service with out code, by depression of "R" and dialing "1"
21	Connection to the busy subscriber with warning about the intrusion	47	
22	Subscriber numbers abbreviated dialing	51	
23	Connection without dialing	52	
24	Automatic wake-up	54 55	Constant Occasional
25	Identification of the calling subscriber number under the request of the called subscriber	59	Code is used by the sub-scriber to "order" the exchange to print out the number

6. SERVICE SYSTEM

6.1. At toll and intrazonal network calls have different grade of service depending on priority category and category of subscriber device:

6.2. Priority categories

6.2.1. At toll networks calls have four categories from the service point of view. 1-3 category calls are priority calls and 4 category calls are without priority.

Priority calls constitute approximately 10% of total number of calls at network. For the goal of the grade of service improvement during damages and overloads at the network, calls of the first three categories are served with advantage. The 4 category calls grade of service may be below than normal.

6.2.2. At ASN and at TTE with stored program control, when TTE carry out the ASN function, calls with 1-4 category are served.

The following service system is recommended.

6.2.2.1. When the trunks are busy, than 1 category calls are served with absolute priority, i.e. with forced call interruption, 2 and 3 category calls - with relative priority according to the system of restricted waiting of trunk release, 4 category calls-according to the system with losses.

6.2.2.2. 1 category calls should have absolute priority of service and of queue set up, i.e. when all trunks are busy, the 1 category call, interrupts the service of 2, 3, 4 category calls, beginning from the lowest - 4 category.

Interrupted call is rejected. In the case when all trunks are busy by the 1 category calls service, newly received 1 category call will be put into the queue to wait for the trunk release.

When all waiting places are busy, the 1 category call remove 2 and 3 category calls from waiting, beginning from the 3 category.

2 and 3 category calls, removed from waiting are rejected. 1 category calls are served first, in order of priority (first arrive, first served).

6.2.2.3. 2 category calls should be served with relative priority (in accordance with the system of restrictive waiting) and with absolute priority when put in the queue.

In the case when all trunks in the required direction are busy, newly arrived 2 category call are put in the queue for waiting.

When all waiting points are busy, the 2 category call is removed from the queue for waiting the 3 category call.

3 category call in this case is rejected. Released trunk is provided for 2 category calls in the case if 1 category calls are not in the queue. Waiting calls are served in the order of arrival. 2 category calls receive rejection in the case when all trunks are busy by 1-4 category calls and all waiting points are busy by 1-2 category calls.

Note: In the case of two subgroup existence, the 2 category calls are put in the queue for waiting the high grade of service subgroup release.

6.2.2.4. 3 category calls are served with relative priority. When all trunks in the required direction are busy, 3 category calls are put in the queue for waiting.

Released trunk is offered for waiting the 3 category calls, in the case if 1 and 2 category calls are not in the queue.

Waiting calls are served in the order of arrival.

3 category calls receive rejection in the case when all trunks are busy by 1-4 category calls and when all waiting points are busy by 1-3 category calls.

6.2.2.5. 4 category calls should be served by the system with losses.

Released trunk is offered to newly arrived 4 category call if the waiting queue is empty.

6.2.2.6. At outgoing ASN (TTE) calls should be put into the waiting queue if all trunks in the LSR groups to their own and adjacent ASN (TTE) of incoming ATE are busy. Trunk release waiting is done in two above mentioned directions. If incoming ATE relies only at one ASN, then waiting is performed one direction.

At incoming ASN (TTE) calls should be put into the waiting queue when all trunks to the destination exchanges of the LSR groups are busy.

6.2.2.7. Quening is individual for each direction.

Number of waiting calls in the direction and waiting time are restricted (number of waiting calls m=2,3; maximum waiting time t< 40 s).

6.2.3. At ATE and TTE when the last one carries out the ATE functions, the 3 and 4 category calls are served.

The following service system is recommended.

6.2.3.1. 3 category calls are served with relative priority according to the system of restrictive waiting of release of trunks, trunk lines (toll) and lines to operator switching positions.

6.2.3.2. At ATE 3 category calls should be put into the waiting queue in the case when trunks in common LSR group including trunks from two outgoing LSR groups to their own and adjacent ASN are busy.

Trunk release waiting is done at two directions-at direction of common LSR group and of DR trunk group. Waiting is performed in the common queue, queue length and waiting time are restricted (m=2,3; t<40 s). Waiting calls are served in the order of arrival. 3 category calls receive rejection when all waiting points are busy and waiting time is out.

Note: When two LSR subgroups exist, 3 category calls are put into the waiting queue only in the subgroup have the high grade of service.

6.2.3.3. At TTE, when it performs ATE functions the 3 category calls are put into the waiting queue in the cases, that are the same when performing the ASN functions,i.e. when trunk groups to their own and to adjacent ASN (TTE) of incoming ATE are busy.

Waiting is performed in the individual for every direction queues by the way that is the same with stated in p.6.2.2.7.

Waiting calls are served in the order of arrival. 3 category calls receive rejection when all waiting points are busy and waiting time is out.

6.2.3.4. 3 category calls should be put into the waiting queue in the case when toll trunk lines, trunk lines to working places of service CO are busy. Waiting is performed in the personnel for every direction queues.

Number of waiting calls and waiting time are restricted.

3 category calls receive rejection when all lines and waiting points of the required direction are busy.

6.2.3.5. 4 category calls service is done by the system with losses. Newly arrived 4 category if there are no waiting calls in the queue.

Notes:

1. In some cases at ATE and TTE performing ATE functions, the 1 and 2 category calls may be served also. Service system for such cases is stated in p. 6.2.2.2.-6.2.2.5.

2. At the second stage of development it is recommended to provide the priority for operators (the 3 category for establishing the connections at toll network. Subscribers should be served with the 4 category.

3. At ATE-1, 2, 3 service with priority is not provided.

4. ATE-5 does not provide the priority service of calls for the transit communication.

6.2.4. At exchanges and nodes of local network the following service system is recommended.

6.2.4.1. All local connections between the subscribers are served without priority by the system with losses.

6.2.4.2. When subscribers are connected with reference and ordered services, such connections may be served with restrictive waiting of release of operators and auto announcement devices.

6.2.4.3. 3 and 4 category toll and intrazonal calls are served at CO.

6.2.4.4. 3 category toll calls are served with relative priority by the system of restrictive waiting of OTL release.

6.2.4.5. 4 category toll calls are served by the system with losses.

Note: Step-by-step and cross-bar exchange do not provide priority service.

6.3. Subscriber devices categories.

6.3.1. Calling subscriber category Cs is detected by the ANI equipment, that is installed at urban, rural exchanges and PBXs. 10 categories are transmitted from ANI equipment:

1 - Residential or business telset with access to the automatic zonal, toll and international network.

2 - Hotel telset with access to the automatic zonal, toll and international network.

3 - Residential, business or hotel telset with access only to the local network.

4 - Business telset with the possibility of access to the automatic regional, toll, international networks and to the chargeable services; preferential access to the zonal and toll network is provided.

5 - Business telset of the ministry of Telecommunication with access to the automatic zonal, toll and international network and to chargeable services; calls should not be charged, but should be registered for statistics.

6 - Toll pay-phone and public call pay station with access to the automatic intrazonal and toll networks; calls are played in cash.

7 - Residential or business telset with access to the automatic zonal and toll networks and to chargeable services.

8 - Business telset for data facsimile and electronic mail with access to automatic zonal, toll and international networks.

9 - Local pay-phone with access to the local network.

10 - Reserved.

6.3.2. At stored program controlled CO along with the categories listed in p.6.3.1, the intra exchange line and subscriber categories are provided, they characterize the subscribers right to use different additional services.

6.4. Priority category (Cp) is determined on the basis of subscriber category (Cs) or category of call (Cc).

Cp	Cs	Cc
1	-	1,2
2	-	3,4
3	4	11,12
4	1,2,5-8	13,14

Note: In separate cases the 2 category calls are served with Cc=11,12 on the basis of incoming point analysis.

7. SIGNALLING SYSTEM

7.1. Signalling system consists of the signals, that provide necessary and sufficient information for subscriber during the automatic communication as well as for operator during the semiautomatic communication, and also information necessary for normal operation of automatic switching devices.

7.1.1. Set of information signals (acoustic and optical), necessary for subscribers and operators.

7.1.1.1. The recommended composition of information signals required for subscribers and operators for toll and intrazonal communication is specified in the tables 7.1. and 7.2.

7.1.1.2. Recommended composition of information signals, required for subscribers for urban and rural communication is specified in the table 7.3.

7.1.1.3. For communication with public data transmission exchange, for mobile communication, for administrative networks, connected to ATE, the composition of information signals should correspond to the information given in the tables 7.1. and 7.2. that is suitable for subscribers in case of automatic communication and for operators in case of semiautomatic communication.

7.1.1.4. For communication of UTN and RTN subscribers with the colluar networks switches and exchanges of administrative networks, connected PSTN local networks, the composition of information signals should correspond to the table 7.3.

7.1.2. All signals needed to provide information to subscribers operators and control devices of the switching units are devided into three groups: line, control and acoustic.

7.2. General requirements for signals transmission.

7.2.1. Signalling system should provide reliable transmission and reception of signals for the maximum number of sequentially connected retransmission sections.

7.2.2. Maximum of all the tone frequency signals (line, control, acoustic echo-suppressor's neutralization) shouldn't exceed 36000 mcWs0 for one direction of transmission and 72000 mcWs0 - for both directions during busy hour (Recommendation Q.15 CCITT, Red Book, b.N1).

7.2.3. Protection of signalling devices from imitation of signal frequencies caused by the information, transmitted from subscribers and operators should provide no more than one false response in 10 hours of impact.

7.2.4. For protection of the adjacent sections of toll and intrazonal networks from penetration of signal frequency, the speech path separation should be foreseen at line equipment.

7.2.4.1. Separation of speech path during automatic and semiautomatic intrazonal toll and international communication should be foreseen in the following cases:

a) for control signals with hardware protection from voice currents;

b) for transmission of the line signals via switching equipment of exchanges and nodes;

c) for providing the stability of toll and intrazonal communication;

d) for protection of the called subscriber line, when it is busy by local, toll or intrazonal communication, from the connection with another calling subscriber.

7.2.4.2. The speech path cutoff should not disturb the transmission of information acoustic signals to the subscriber.

7.2.4.3. During transmission of the control signals, the protection of control signals receiving equipment should be ensured by transmission path separation from the calling sub scriber or operator before the connection establishment.

7.2.4.4. The speech path cutoff is provided by the ATE toll trunk line devices to prevent the connection of the calling party to the called subscriber line for the all types of automatic communication.

7.2.4.5. Stability during toll and zonal connections may be ensured by cutoff of speech path, or by connection of some extension devices or load impedances into transmission path before the called subscriber answer or after ring-off.

7.2.5. For the goal of elimination of crosstalk influences between trunks the absolute power level of every component of short-term signal in the point of zero relative level should not exceed values shown in table 7.4. (Recommendation Q.16 CCITT, Red Book, b.VI.1).

7.2.6. All signals, transmitted between subscriber devices via switching network should not affect signalling devices of exchanges and nodes. Echo-suppressors neutralization signal, that is transmitted before the beginning of duplex information transmission (exp. data transmission) at 2100 Hz frequency with duration 4.5 - 7 s, should not affect signalling devices. Signal recognition time is 4 s. Neutralization device should be switched off in 150 ms after the end of data transmission.

7.3. Line Signals.

7.3.1. Composition of line signals.

7.3.1.1. Line signals are transmitted via telephone trunks, interexchange trunks, and, in separate cases via intraexchange trunk lines between speech path devices and via CCS in forward as well as in backward direction in idle state and during connection establishment until complete release of devices. These signals correspond to the main stages of connection establishment (idle state, seizure, answer, disconnection and etc.).

7.3.1.3. Recommended composition of line signals, transmitted via toll, intrazonal and local networks is given in table 7.5.

Note: At separate sections of toll network the composition of line signals, given in table 7.6. may be used.

7.3.1.4. For communication with data transmission exchanges, mobile exchanges and department networks, the composition of line signals is given in table 7.5.

7.3.2. Ways of Line Signals Transmission

7.3.2.1. It is recommended to use the following ways of line signals transmission at toll network:

- frequency, at 2600 Hz;
- via CCS;

Notes:

1. It is allowed to use two-frequency signalling system at 1200 and 1600 Hz for communication with AMTC-1,2,3 only.

2. At any switching section of network it is recommended to use only one signalling method.

7.3.2.2. Are recommended the following ways of line signals transmission at intrazonal network:

- one frequency at 2600 Hz;
- loop circuit signalling via physical four-wire lines;
- channel associated signalling, using one channel in the analog systems;
- CAS, using one or several channels for one telephone channel in the digital transmission systems;
- via CCS (common channel signaling).

Note: Via three-wire physical lines it is allowed to use battery method of line signals transmission.

7.3.2.3. At the trunks of toll and intrazonal networks, used for semiautomatic communication, the one frequency way line signaling (2600 Hz) should be used.

Note: It is allowed to use two-frequency - 1200 Hz and 1600 Hz - signalling.

7.3.2.4. When two ATE interact in one zone it is recommended to use signalling at one frequency (2600 Hz) via CCS.

Note: It is allowed to use two-frequency signalling at 1200 Hz and 1600 Hz.

7.3.2.5. The following ways of line signals transmission are recommended at local networks (UTN, RTN, CTN):

- CAS using one or two signalling channels for one telephone channel of digital transmission systems;
- CAS using one signalling channel for analog transmission systems;
- loop signalling via two-wire physical line;
- CAS using one signalling channel and via second channel in voice frequency band at 2600 Hz or CAS in analog transmission systems;
- battery way via two and three-wire physical lines.

7.3.3. Signalling codes.

7.3.3.1. Signalling codes of line signals transmission via toll, intrazonal and local networks are given in tables 7.7.-7.21.

Notes: 1. In particular developments, parameters, given in tables may be changed if that changes are justified and agreed. The requirement of interfacing with earlier produced equipment without it's modifying should be fulfilled.

2. The transmission of line signals via "a" and "b" wires through switching field of CO without retransmission should be done by battery way in accordance with the tables 7.13. and 7.14.

3. In the code tables 7.8.-7.20. line signals as well as signals of decadic dialing are given, as they are transmitted at the frequency of the line signals transmission via the same signalling channels and wires.

7.3.3.2. The transmission of line signals from public exchanges of data transmission, from mobile exchanges and enterprise network should be done by one of the ways, recommended for local intrazonal and toll networks. Matching devices should be installed at above mentioned exchanges.

7.3.4. Requirements to the line signals transmission.

7.3.4.1. The specification of conditions of line signals transmission and reception in the voice frequency band is given in the table 7.22.

7.3.4.2. Parameters of subscribers and trunk lines, that are taken into account during the exchange equipment design, should correspond to the values, given in the table 7.23.

7.3.4.3. The line signals transmission via toll and intrazonal networks should be done by retransmission sections.

7.3.4.4. The line signal "answer" propogation time through the maximal number of switching sections (up to 11) should be minimized.

At local and intrazonal networks the average time of transmission of signals "answer" " ANI REQUEST" via every retransmission section in the normal conditions, should not exceed 70 ms for TL, OTL and 100 ms for toll TL.

7.3.4.5. During the connection establishment the possibility of multiple transition of speech path devices into the answer and preanswer state should be provided.

7.3.4.6. The ATE equipment during the establishment of incoming toll connections should provide the ring (automatic and repeated) by the signal from ATE; disconnection only from ATE.

7.3.4.7. To prevent the call losses, the detection of line signal "BLOCK" should be done as quickly as possible in the minimal time. The requirement to the value of this time depends on technical design of equipment, connected at outgoing and incoming parts of trunk line.

7.3.4.8. At local intrazonal networks the line signal "seizure" should be transmitted via TL, OTL in the minimal time, as quickly as possible. Requirement to detection of this signal depend on the method of connection control from the party of outgoing ATE.

During the establishment of connection from the CO with direct way of control, the time from arrival to incoming CO of the line signal "SEIZURE" to the connection of the dial pulses receiver should not exceeds 70 ms.

During the establishment of connection from CO with indirect way of control if the signal "SEIZURE" is transmitted constantly until the "DISCONNECTION", it is allowed to increase the detection time at incoming CO, ATE up to 200 ms.

7.4. Control signals

7.4.1.1. Composition of control signals.

Control signals include electrical signals that are transmitted from telset in forward direction, and also signals that are transmitted between control devices of exchanges and nodes in the process of connection establishment both in forward and in backward directions.

Control signals consist of: numbering information, call category, type of message, ANI request, ANI information and etc.

7.4.1.2. Composition of control signals at various sections of toll network is given in table 7.24. (for one or two-frequency signalling systems).

Complete composition of control signals transmitted in forward direction for one frequency signalling system is as follows Cc Ses Ns Ed where,

Cc - call category signals, that determine the system of call service and types of connections (automatic and semiautomatic) at exchanges and nodes of toll network;

Se-s - signals that determine the conditions of echo-suppressors connection.

Ns - toll or intrazonal number of calling subscriber, service CO, toll services, department networks and data transmission exchanges.

Ed - end of dialing For communication with ARM exchanges the Se-s signal is not transmitted in the control signals composition.

In the backward direction the control signals are transmitted via the toll network in the form of one digit before the transmission and one digit after the transmission of information in the forward direction.

Only number is transmitted between the automatic CO-1,2,3 exchanges and between these exchanges and exchanges of other types.

The abbreviated code 1 is transmitted instead of ABC code via DR and at the last section of IAR and LSR in the case of two-frequency signalling system use.

7.4.1.3. Composition of signals at intrazonal and local networks is given in tables 7.25-7.27.

7.4.1.4. Transmission of ANI information via OTL may start from any digit and have the following view . SCs UTHTh XSCs

where, S - working combination

START Cs - calling subscriber device category

UTHTh - combinations of unit, ten hundred and thousand digits of calling subscriber number.

X - third, second and first digit of zonal number.

The special combination REPETITION is used to transmit two equal digits on ajacent positions this combination is transmitted from ANI instead of repeated digit; if several equal digits follow one after another, the combination REPETITION is transmitted instead of second fourth etc. digits of the number. When category and number of calling subscriber are not detected it is recommended to define this call as call from subscriber with third category.

7.4.1.7. To provide an access to toll and intrazonal network from CO without ANI to test the reliability of the own number dialing by the calling party it is necessary to establish connection via toll TL with the calling subscriber line is send via the loop created the control (frequency) signal.

7.4.2. Methods of transmission and parameters of control signals.

7.4.2.1. It is recommended to transmit the control signals via toll network by sections (from point to point) and with integration.

Notes:

1. At tandems for connection of two trunks with two-frequency signalling system the transmission of numbering information with partial frequency is foreseen.
2. For connection of two-frequency signalling trunks via ATE-2,3 (in the case of connection from district centre operator) the zonal code is transmitted with accumulation, and zonal number - with retransmission at the intermediate point.

7.4.2.2. At intrazonal and local networks the transmission of control signals is provided both by sections (in the case of pulse packet way of transmission) and from end to end (in the case of pulse shuttle and gapless packet ways of transmission). Decadic dialing is transmitted with retransmission via intermediate exchanges (nodes).

7.4.2.3. Control signals are transmitted through the network in the preanswer state, excluding sections of TL and OTL at which it is possible to transmitt control signals in the answer as well as in the preanswer state.

a) via OTL: in the preanswer state signals are transmitted by decadic code and by the "pulse packet" method, in the answer state signals are transmitted by the "pulse packet" and "gapless packet";

b) via TL: in the preanswer state signals are transmitted by decadic code by "pulse shuttle" method, in the answer state - by "gapless packet".

7.4.2.4. Transmission of numbering information via extension line should be done by decadic pulses or by dual-tone multifrequency (DTMF) code.

7.4.2.4.1. Parameters of DTMF Code Signals.

a) Every digit is transmitted by bursts of two signalling frequencies, selected from two groups: lower group - 697, 770, 852, 941 Hz; higher group - 1209, 1336, 1477, 1633 Hz;

one frequency from lower group and one frequency from higher group are transmitted; in all cases tolerances of transmitted frequencies should be within the interval +/- 1.5%;

b) total level of non-linear distortions during the transmission of every frequency should be more than 20 dB less than the level of the weakest component;

c) duration of bifrequency burst should be no less than 30 ms, and duration of pause - no less than 25 ms.

7.4.2.4.2. Parameters of decadic code signals.

a) for rotary dialing telsets duration of:

break and make of pulse circuit (period) - 90-110 ms;
break (pulse) - 53-69 ms;
make (pause) - 33-46 ms;
ratio of break duration to make duration (pulse ratio) 1.4-1.7;
pause between the last pulse in the series of breaks and the beginning of the new series should be no less than two periods.

Note: During the whole operation time the more wide limits of duration parameters are allowed:

period (at speed 8.5-11.8 pulses/s) - 85-117 ms;
break - 49-75 ms;
make - 30-50 ms;
pulse ratio - 1.35-1.8;

b) for electronic chalers in factory conditions and for the whole operation time the duration of:

period - 95-105 ms;
break (pulse) - 56-64 ms;
make (pause) - 37-43 ms;
pulse ratio - 1.45-1.55;

pause between the last pulse in the series of breaks and the beginning of new series should have the following gradations of duration:

4T+/- 5%,
6T+/- 5%, 7,4T+/- 5%,
8T+/- 5%, 10T+/- 5%,
where T-duration of pulse period;

c) for subscriber translating devices, intended for connection to CO as telsets:

in production the duration of outgoing signals should correspond to the pulse ratio from 1.4 to 1.7 (at speed 7.5 - 12.5 pulses/s and input pulse ratio of signals equal to 1.3-1.9);

during the whole operation time the output pulse ratio of signals should lie withing the limits from 1.35 to 1.8 (at speed 8.5-11.8 pulses/s).

7.4.2.5. The following ways of control signals transmission are recommended at toll network:

multifrequency,"pulse packet" method;

binary code via CCS.

Notes:

1. During the work via s/a trunks the "pulse packet" is transmitted from push-button dialler.

2. During the work with the automatic CO -1,2,3 and via the two-frequency s/a trunks the transmission of dial pulses by the frequency decadic code is allowed.

7.4.2.6. The following wayes of control signals transmission are recommended at intrazonal networks:

multifrequency, "pulse shuttle" (at toll TL) and "pulse packet" and "gapless packet" (at OTL);

frequency decadic code for dial pulses (at OTL);

binary code via CCS.

Notes:

1. Multifrequency "pulse packet" method (from push-button telset) should be used at s/a trunks. In the case of two-frequency signalling system it is allowed to use the frequency decadic code .

2. When AMTS-1,2,3 works with CO of all types via toll TL, and when ATE of all types work with step-by-step CO, the decadic code dial pulses transmission by decadic code is allowed.

7.4.2.7. The following ways of control signals transmission are recommended at local networks:

multifrequency, "pulse shuttle";

binary code via CCS or via common control channel (CCC).

Notes:

1. Decadic code dial pulses are allowed for interaction with step-by-step exchanges;

2. At RTN for control signals transmission it is allowed to use inductive way (for connections between existing exchanges) and battery way (for connections between ATCK-100/2000 exchanges).

7.4.2.8. Multifrequency way of control signals transmission foresees the use of selfverification code "2 out 6", given in Table 7.28.

The following frequencies are used:

f0 = 700 Hz;

f1 = 900 Hz;

f2 = 1100 Hz;

f4 = 1300 Hz;

f7 = 1500 Hz;

f11 = 1700 Hz;

7.4.2.9. Ways of control signals transmission at international, intrazonal and local networks are given in Tables 7.29 - 7.33.

7.4.2.10. Control signals parameters that are transmitted at toll and intrazonal networks by multifrequency "pulse packet" method.

Duration:

pulse - 40-60 ms;

pause - 40-60 ms;

pulse and pause detection time is 20-30 ms.

Note: During the semiautomatic communication the control signals parameters depend on operators speed of work, but the pulse duration should be no more than 2s, and pause - no more than 10s.

7.4.2.11. Control signals parameters that are transmitted via local and intrazonal network by multifrequency method:

a) "pulse packet"

pulse duration 40-60 ms,

time from the end of signals receiving to the start of digit's transmittion - 60-90 ms;

b) "gapless packet" pulse duration - 34-40 ms.

7.4.2.12. Parameters of information request signal from CO (OTLN) with the signal frequencies 700 and 1100 Hz:

signal duration 70-100 ms.

7.4.2.13. Parameters of dial pulses that are transmitted by decadic code between exchanges and nodes of toll and intrazonal networks (ATE, ZTN, ASN).

7.4.2.13.1. Parameters of pulses at the input of exchanges and nodes:
a) via OTL (at ATE and ZTN input), duration:
pulse - 28-105 ms;
pause - 27-85 ms;
interseries interval no less than 400 ms;
b) via toll TL:
from ЂЊ"-5-10 and ASN,
duration:
pulse - 40-60 ms;
pause - 40-60 ms;
interseries interval 650-800 ms;

from ЂЊ"-2,3 (at speed 9-11 pulses/s);
duration:
pulse - 33-79 ms;
pause - 31-71 ms;
interseries interval no less than 500 ms.

7.4.2.13.2. Parameters of signals and the inputs of exchanges and nodes:
a) via toll exchanges (at speed 9-11 pulses/s):
from ЂЊ"-5-10,
duration:
pulse - 40-60 ms;
pause - 40-60 ms;
interseries interval 650-800 ms;

from automatic CO -2, automatic CO -3,
duration:
pulse - 40-90 ms;
pause - 36-90 ms;
interseries interval no less than 650 ms.
b) via toll channels: see p.7.4.2.13.1.b.

7.4.2.14. Parameters of dial pulses, that are transmitted by decadic code between the exchanges and nodes of local network (PBX,CO,ITT,OTT,RSN).

7.4.2.14.1. Parameters of pulses at the input of exchanges and nodes:

a) from loop devices of subscriber terminals:

b) in production, during training and after repairs (at

speed 7.5-12.5 pulses/s and pulse ratio 1.3-1.9).

duration:

pulse - 46-88 ms;

pause - 28-58 ms.

interseries interval no less than 400ms.

during operation (at speed 8.5-11.8 pulses/s and pulse ratio 1.35-1.8)

duration:

pulse - 49-75 ms;

pause - 30-50 ms.

interseries interval no less than 450 ms.

Note: When subscriber translating devices are connected into CO as telsets, the requirements to the receivers of loop pulses should be matched with requirements to the output parameters of these translating devices.

b) via physical trunk lines:

in production, during adjustment and after repairs (at speed 7-13 pulses/s)

duration:

pulse - 58-105 ms;

pause - 38-85 ms.

(at speed 7 pulses/s);

duration:

pulse - 28-49 ms;

pause - 28-49 ms.

(at speed 13 pulses/s);

duration of interseries interval no less than 400 ms;

during operation (at speed 8.5-11.8 pulses/s)

duration:

pulse - 51-73 ms;
pause - 44-66 ms.
(at speed 8.5 pulses/s);
duration:
pulse - 33-53 ms;
pause - 32-52 ms.
(at speed 11.8 pulses/s).
interseries interval no less than 450 ms;

c) parameters of pulses, that are transmitted between outgoing and incoming trunk line equipment depend on the way of trunk line signals transmission and are given in the corresponding tables of signalling codes.

7.4.2.14.2. Parameters of pulses at the output of exchanges and nodes:
a) from devices, transmitting pulses without correction and integration:
during production, during adjustment, after repairs (at speed 7-13 pulses/s)
duration:
pulse - 61-81 ms;
pause - 50-72 ms.
(at speed 7-7.5 pulses/s);

pulse - 32-49 ms;
pause - 32-49 ms.

Note: Change of output pulse duration compared to input one (distortion) should provide reduction of difference between duration of pulse and pause.

at operation period (at speed 8.5-11.8 pulses/s)
duration:
pulse - 51-73 ms;
pause - 44-86 ms.
(at speed 8.5 pulses/s);
duration:
pulse - 33-53 ms;
pause - 32-52 ms.
(at speed 11.8 pulses/s);

b) from devices, transmitting pulses without integration, but with correction:
during production, during adjustment, after repairs (at speed 7-13 pulses/s)
duration:
pulse with correction (60+/-3) ms (at speed 7-8.5 pulses/s);
pulse with correction (43+/-3) ms (at speed 10-13 pulses/s).
last pulse, in the case of it's forming (58+/-4) ms,
pulse with correction (60+/-3) ms. or pause (43+/-3) ms. (at speed 8.5-10 pulses/s).

Notes: Recommendations to correction devices.

1. It is necessary to assure alignment of pulse and pause duration (to approximate the pulse ratio to 1) for speed range from 7 to 13 pulses/s, paying special attention at the range from 8.5 to 11.8 pulses/s).

2. It is necessary to provide the delay of pulses transmission after their reception at time equal to one period (or at time approx. 100 ms) for the goal of protection against false connection and premature ring-off of calling subscriber.

3. It is necessary to maintain the duration of input period of pulse and pause during transmission.

During operation (at speed 8.5-11.8 pulses/s)
duration:
pulse with correction (63+/-6) ms;
pause with correction (43+/-6) ms;
last pulse, in the case of its forming (58+/-8) ms.
c) from devices, providing accumulation of messages (registers or similar devices):
during production, during adjustment, after repairs duration:
pulse - (50+/-3) ms;
pause - (50+/-3) ms;
interseries interval - (725+/-50) ms;

Interval before the start of decadic code dial

pulses transmission - (400+/-100) ms.

during operation duration:
pulse - (50+/-5) ms;
pause - (50+/-5) ms;
interseries interval - (725+/-75) ms;
Interval before the start of decadic code dial
pulses transmission - (400+/-100) ms.

7.4.2.14.3. Connection of speech path to trunk line should be assured not earlier than 30 ms after the end of transmission of the last pulse of the decadic series.

Note: Some devices of existing exchanges do not assure parameters, stated in p.7.3.2.14.

7.4.2.15. Characteristics of control signals reception and transmittion conditions in speech spectrum are given in the table 7.34.

7.4.3. Composition of signals, ways of control signals reception and transmission for access of dedicated network, data transmission and mobile exchanges to PSTN should correspond to composition, ways of transmission and control signals parameters at corresponding parts of PSTN.

7.5. Information acoustic signals

7.5.1. Informational acoustic signals are necessary to inform the subscriber or operator about the state of connection. Since the PSTN is connected to automatic international network the parameters of information signals should correspond to CCITT Recommendations.

Note: In some cases the tone signals may be used for the individual stages of connection, e. g., during connection of the auxiliary devices for additional services.

7.5.2. Composition, ways of transmission and parameters of signals.

7.5.2.1. Informational acoustic signals are transmitted as a tone and magneto signals, or as a automatic voice announcement.

7.5.2.2. Tone signals transmission level in the point with zero relative level should have the nomial value equal to -10dB +/- 5 dB.

Level of acoustic signals, transmitte to subscriber during the conversation and measured tn the same point should be -15 +/- 5dB (for networks with the stored program control exchanges).

7.5.2.3. Automatic voice announcement should have average power level, that does not exceed the average level of speech currents (-22 mkW in the point with zero relative level).

7.5.2.4. The following acoustic signals are used at the exchanges and nodes of toll and intrazonal networks. Tone:

DIAL TONE - continuous frequency transmission (425+/-25) Hz;

BUSY - periodic frequency pulses (425+/-25) Hz.

with duration: pulse 0.3-0.3 s;

pause 0.3-0.4 s;

RING-BACK_TONE -periodic frequency pulses (425+/-25) Hz with duration: pulse 0.8 s or (1+/-0.1)s;

pause 3.2 s or (4+/-0.3)s.

WAITING - sequential transmission of three frequencies: (950+/-50) Hz;

(1400+/-50) Hz;

(1800+/-50) Hz.

with duration: pulse (0,330 +/- 0.07) s;

pause up to 0.03 s.

Signal is transmitted in pauses between the words of automatic voice announcement "WAIT".

If number of three- frequency signals between the words of voice announcement is no less than two, than the interval (pause) between three-frequency pulses should be (1.0+/-0.25)s.

Automatic voice announcements phases pronounced in Russian:

FALSE DIALED NUMBER;

CALL THE OPERATOR (subscriber has the category without access to the toll automatic communication, selected route is eliminated from automatic service);

WAIT.

Note: Transmission of tone signals "Ready to code dialing " and "Ready to number dialing" from exchanges and nodes of all types is allowed only on the parts of direct connections with ATE-3 and with two-frequency semiautomatic quipment, if the last is the outgoing one.

At the other parts of network the above mentioned signals are recommended to liminate to ensure the reduction of the trunks load.

"Ready to code dialing" signal is the continuous (425+/-25) Hz frequency transmission.

"Ready to number dialing" signal is the periodic transmission of (425+/-25) Hz frequency in a dot-dash code:

pulse - 200 ms, pause - 200 ms, pulse - 600 ms, period – 1500 ms.

7.5.2.5. The following acoustic signals are used at exchanges and nodes of urban and rural networks.

a) magneto:

RING, for local communication as a periodic frequency transmission (25+/-2) Hz with the voltage in the pointof outgoing transformer equal to (95+/-5) V and with transmission parameters:

pulse (0.8+/-0.1) or (1+/-0.1) s;

pause (3.2+/-0.3) or (4+/-0.3) s;

the first ring tone should be no less than 0.3 s;

RING for toll, intrazonal and international communication with the parameters:

pulse (1.2+/-0.12) s;

pause (2+/-0.2) s.

b) tone:

RING TONE, for local communication as a sequential three-frequency transmission in the range 400-700 Hz (at first - the second frequency, when first and then third) with duration of every frequency component (0.3+/-0.03) with total duration approx.1 s; pause between the three –frequency transmission (4+/-0.4), duration of the first pulse (of one frequency) no less than 0.3 s. Signal level at the subscriber line input is (0+/-1) dB.

DIAL TONE as a continuous (425+/-25) Hz frequency transmission.

BUSY as a periodic (425+/-25) Hz frequency pulses with duration:

pulse 0.3-0.4 s;

pause 0.3-0.4 s;

RING_BACK_TONE as a periodic (425+/-25) Hz frequency

pulses with duration:

pulse (1+/-0.1) s;

pause (4+/-0.4) s.

Operation of existing exchanges with parameters,

(0.8+/-0.1)s. and (3.2+/-0.3) s. is allowed.

When local calls are established with special note "control",

the RING and RING_BACK_TONE should be synchronious.

WARNING ABOUT THE END OF PAYED PERIOD as two-, three pulses of (1400+/-140) Hz frequency with duration:

pulse (1+/-0.1) s;

pause (1+/-0.1) s.

Signals level at the exchange end of subscriber line is minus 4 - 0 dB; when from pay-phone - minus 14 - minus 12 dB.

Signal is sended in (20+/-2) s. before the end of payed period.

With introduction on the networks the perspective stored program controled exchanges the following tone signals may be added:

BUSY BECAUSE OF OVERLOAD - as periodic (425+/-25) Hz

frequency pulses with duration: pulse 0.15-0.2 s;

pause 0.15-0.2 s.

SPECIAL INFORMATION TONE - as a sequential transmittion of three frequencies (950 +/- 50) Hz, (1400 +/- 50) Hz,

(1800+/-50) Hz. Duration of every frequency transmittionis

(0.33+/-0.07) s, duration of interval between three-frequency

transmission is (1.0+/-0.25) s.

This signal informs the subscriber that it is impossible to establish connection because of stable reason (subscriber's line disconnection, subscriber's category change);

RECORD SIGNAL as a periodic (1400+/-20) Hz frequency transmission with duration:

pulse (0.4+/-0.04) s;

pause (15+/-3) s.

Signal is sent during the conversation and it informs the subscriber that his conversation (speech) is recorded (for example, by subscribers autoresponder).

Introducing the supplementary services the following signals may be added.

CONFERENCE PARTICIPANT REMOVAL - single (425+/-25) Hz
frequency pulse during 0.3-1.0s.

Signal is sended during conversation and informs the conference participants that one of them is removed;

NON TOTAL ASSEMBLY - single (425+/-25) Hz frequency pulse that is transmitted within 0.3-1.0 s.

It is sended after the determined value of time in the case of non total assembly of conference participants.

CONFIRMATION OF SERVICE RECEPTION (IMPOSSIBILITY OF RECEPTION):

Signal ANSWER is sent in the case of service order (or cancelation) detection, when it is impossible to receive service order (for example, subscriber has no right to order such service) the SPECIAL INFORMATION TONE is sended.

CALL WAITING TONE - periodic (425+/-25) Hz frequency transmission with parameters: pulse (0.2+/-0.02) s;
pause (5+/-0.5) s.

Signal is sent during the conversation and informs busy subscribers about the call from the third subscriber.

This signal is sended only in the case if one of the subscribers have ordered the corresponding service.

INTRUSION TONE - periodic (425+/-25) Hz. Frequency transmission with parameters:
first pulse (0.25+/-0.025) s;
first pause (0.25+/-0.025) s;
second pulse (0.25+/-0.025) s;
second pause (1.25+/-0.3) s.

Signal is sended during the conversation and informs the PBX subscribers, busy by conversation, about the prority subscriber or operator connection.

c) Automatic voice announcements (for exchanges with stored program control).

NUMBER IS CHANGED;

NUMBER IS NOT IN USE;

NUMBER IS SWITCHED OFF;

TELSET IS SWITCHED OFF BY SUBSCRIBER.

Introducing the exchanges with stored program control and increasing the number of services other tone signals and automatic voice announcements may be used.

7.5.2.6. PBX and mobile exchange subscribers in the case of access to local network may receive the DIAL TONE from their own exchange in addition to signals stated in p.7.5.2.5.

7.5.2.7. In the case of connection with data transmission network, enterprise (private) network and mobile exchanges,

that are connected to ATE and ASN, the composition of signal can not exceed the number of signals, stated in p.7.5.

7.6. Time control of separate stages of connection establishment should be foreseen in the exchanges and nodes.

Time-outs are given in Table 7.35.

7.7. Common channel signalling CCS.

7.7.1. CCS serves for transmission of signals that are necessary for connections between CO (ATE) with program control. In addition to above mentioned signals, CCS system should provide the transmission of signals that are necessary for additional services, charging, maintenance and operation.

In future, CCS system should ensure all necessary signals transmission via the networks with integrated service. CCS system should correspond to the CCITT signalling system N7.

CCS system mey be used at toll, intrazonel and local networks.

7.7.1.1. The speed of signals transmission via CCS is -2.4; 4.8; 64 kBits/s.

7.7.1.2. CCS signalling system may operate in three modes: associated, quasi-associated and non-associated. In the case of associated mode of operation the separate CCS is assigned for every group of speech paths. In the case of quasi-associated mode of operation, the CCS may have several sections and points of signalling, but messages, that are as sociated with served group of speech paths pass via one determined trunk. For non-associated mode of operation, signals

are transmitted via one or more sequentially connected CCS, and the paths differ from the served speech pathes.

7.7.1.3. CCS is organized on the basis of standard non-switched voice-frequency channels of frequency modulation transmission systems or digital transmission systems, digital trunks or physical cable lines. Signals are transmitted via CCS sequentially by sections: from one section to another only after processing.

7.7.2. Signalling messages, that are transmitted via CCS are devided into five types:
- signalling in telephone network;
- signalling network control;
- signalling section state;
- signalling network measurements and maintenance;
- telephone network operation.

Telephone network signalling messages are separated into following groups:

Forward direction:
- telephone connection control;
- connection establishment.

Backward direction:
- ANI or other information request;
- successful end of connection establishment;
- non-successful connection establishment.

In both directions:
- connection state;
- channel or trunk line state;
- trunk group blocking control;
- additional signals between exchanges.

Telephone network signalling messages are given in the Table 7.36. Signalling network control messages - in the Table 7.37, codes and composition of signals of signalling section state are given in the Table 7.38.

Composition and codes of signalling messages of measurements and signalling system maintenance and of telephone network operation will be defined in future.

7.7.3. Signalling messages should be transmitted via CCS in composition of signalling units, that are to contain:

- functional part (signalling units transmission control);
- address part (number of trunk or exchange, to which the transmittinginformation is related);
- the signalling message, actually.

Length of signalling unit may be changed in accordance with information transmitted.

Functional part of signalling unit should contain indicators of communication type and indicators of auxiliary field of unit. Codes of communication type indicators are given in Table 7.39, and codes of auxiliary field indicators - in Table 7.40.

Address part of signalling message consists of the outgoing signalling point code, incoming signalling point code, and number of telephone trunk in the trunk group (if the connection establishment) or of the signalling section code (for messages of signalling network control and signalling section state).

Signalling point code depends on the code of exchange (Node) where this point is located.

Exchange (node) code may have the following view:

toll exchange - ABCn, where "n" is defined on the basis of "ab" analysis;

local exchange - abx, bx, x with 7-,6-, and 5- digit numbering correspondingly.

Signalling messages codes are given in Tables 7.41-7.56.

7.7.4. Reliability of signalling messages transmission should be assured by retransmission of signalling units that were received with faults. The cyclic code should be used for the detection of signalling units that were received with faults.

Note: For channels with low quality of transmission (faults ratio more than 10^5 (10E 5)) the code – independent method of transmission, basedon CCITT Recommendation V-41 may be used.

7.7.5. When the CCS system is used, the speech path is not checked during the connection establishment because line signals are not transmitted via it. To eliminate the possibility of failure the looptest of speech path failure may be foreseen in the system. The loop test consists of the receiver/transmitter connection to the trunk at the outgoing exchange and of the loop organization. The loop test should be done by sections.

7.7.6. CCS trunk should correspond to existing standards for electrical parameters of typical UATN trunks.

7.7.7. CCS system should have the following parameters:

7.7.7.1. Probability of reception of signalling unit with undetected fault should be no more than 10^-8 (10E-8).

7.7.7.2. Delay of ANSWER signal because of retransmission should not exceed 300 ms with probability equal to 10^-4 (10E-4) at every signalling section. Average time of ANSWER signal transmission via every section should not exceed 20 ms (without taking into account the time of signal propagation via the trunk).

7.7.7.3. The CCS stand- by system should provide no more than 4*10^-6 (4*10E-6) CCS fault probality.

7.7.7.4. CCS should be under the control fo all the time, even in the case of useful information transmission absence.

7.7.7.5. Share of unsuccessful connections caused by CCS signalling faults should not exceed 10^-5 (10E-5).

7.7.7.6. When organizing the CCS path, the number of number of sections of satellite communication should be no more than one.

7.7.7.7. Interruption of communication in the stand-by signalling section between the exchanges (nodes) for 10 minutes is allowed no more than once in a year.

7.7.8. CCS network structure.

Signalling network consists of signalling points and signalling sections. At UTN, mainly, the associated method of network structure should be used with partial application of quasi-associated method. At UTN with ITT and OTT network between IOTT (or between ITT and OTT) is organized by the principle "each outgoing" with "each in coming". For reliability assurance the signalling sections are duplicated and they work in the mode of traffic sharing. CO are connected by stand by signalling links with IOTT (or with ITT and OTT) of their own tandem district, and, if the there is sufficient traffic, with CO of their own and of different tandem districts. At UTN with ITT, CO are connected by stand-by signalling sections with ITT of their own and all the other tandem districts, and, if there is sufficient traffic, with CO of their own and of different tandem districts. At UTN without tandems CO are connected by stand-by signalling sections by the principle "each with each" (associated method) or with the use of quasi-associated method; when signalling sections connect in pairs only part of COs and for several CO pairs CCS passes through several sections and points of signalling.

Reliability of CCS network is assured by duplication of signalling sections and by transition at quasiassociated mode of operation. At RTN the associated mode of operation should be used and reliability have to be assured by signalling sections duplication.

At CTN the CCS connects RSN (CO) with CO, ITT, OTT (depending on UTN structure).

At toll telephone network, from economic point of view, it is better to use the quasi-associated method of CCS network structure. In this case all LSR sections should be supported by CCS. For the goals of reliability no less than two CCS trunks should be foreseen at every signalling section.

The CCS network may be used at DR and IAR sections when it is necessary.

The associated method of CCS structure should be used for directions where the group capacity is more than 200 trunks.

If there is no CCS section at any network part, than the following versions are possible:

- if connection is established via DR and there is no CCS section at DR, than signalling messages pass through IAR;

- if connection is established via DR, but there are no CCS sections at DR and IAR, than signalling messages are transmitted via LSR;

- if connection is established via IAAR, and there are no CCS sections at IAR parts, than signalling messages are transmitted via LSR.

7.7.9. CCS signalling system provides interaction with existing signalling systems. This is achieved because of the fact that signals, transmitted via local, intrazonal and toll networks without CCS are the integral part of the CCS messages. Signals, that are used only in CCS system will not be transmitted in other signalling systems ,be transmitted only after DIAL TONE (from ATE) receiving.

Table 7.1. Information acoustic signals for automatic toll and intrazonal communication.

State of connection	Tone	Artificial Voice announcements
1	2	3
Subscriber off-hook:	DIAL TONE	-
- CO devices are free	(from CO)	-
- CO devices are busy	BUSY	
Access code "8" dialing:		
- no access to ATE(OTL)	BUSY	
- or all ATE registers are busy	DIAL TONE	
- ATE devices are free	(from ATE)	
Dialing:		
- delay of digits dialing	BUSY	
- call from subscriber with category without access to automatic toll and intrazonal communication		Call the operator
- dialing of unexisting toll code		incorrect dialing
Lack of free trunks at the own or at transit exchanges:		
- for subscribers without priority	BUSY	WAIT
- for subscribers with priority:		
put into queu;	BUSY	
lack of free line of waiting		
Lack of free devices or congestion at own, transit or incoming toll exchanges	BUSY	
Selected direction is out of automatic service		Call the operator
Lack of free toll trunk lines at incoming ATE:	BUSY	WAIT
- for subscribers without priority		
- for subscribers with priority:	BUSY	
put into queu;		
lack of free line of waiting		
Lack of free toll trunk lines of local network	BUSY	-
Subscriber line is busy by local or toll connection, or is unaccessible	BUSY	-
Subscriber line is free	RING_BACK_TONE (the ring signal is sent to the called subscriber simultaneously)	-
Answer	Cancelation of RING_BACK_TONE	-
Release	BUSY	-

Table 7.2. Information signals, necessary for operator in the case of semiautomatic toll and intrazonal network.

State of connection	Tone	Voice announcement	Optical signal at switching board	
			cordless type	cord type
1	2	3	4	5
| Line seizure				when plug is inserted into the socket of outgoing line RL switches on.
Register connection			LL switches on	RL switches off
Dialing:			LL blinks	RL blinks
delay of digits dialing by the operator				
dialing of unexisting code		incorrect dialing	LL blinks	RL blinks
switching of the line field			SL switches on and is lit till the end of connection	
register removal after the end of dialing			RL switches on. LL switches off.	RL switches off.
Lack of free trunks at the own or transit ATE(ASN) or free toll trunk lines at incoming ATE:	BUSY			
- for switch board working places without priority			RL blinks	RL blinks
- for switch board working places with priority:		WAIT	RL burns	RL burns
call put into queu				
lack of free lines of waiting	BUSY		RL blinks	RL blinks
Lack of free devices or congestion at own, transit or incoming ATE(ASN)	BUSY		RL blinks	RL blinks
Lack of free toll trunk lines of local network	BUSY		RL blinks	RL blinks

Table 7.2. (cont.)

1	2	3	4	5
Subscriber line is busy by local or toll connection	BUSY		RL blinks	RL blinks
Subscriber line is unaccessible			RL blinks	RL blinks
Subscriber line is free	RING_BACK_TONE (ring to called subscriber)		RL blinks	RL blinks
Answer	Stop of RING_BACK_TONE		RL switches off	RL switches off
Release			RL switches on	RL switches on
Repeated call			RL is lit	RL is lit
Refusal of called subscriber from local connection in favour of the toll one:			RL switches on	RL switches on
- called subscriber on-hook				
- operators call to called subscriber			RL is lit	RL is lit
called subscriber answer			RL switches	RL switches

RL - ring-off lamp

LL - line lamp

Notes to Tables 7.1. and 7.2.:

1. If communication is established via ATE-2 andATE-3 it is allowed to use composition of information signals a little different from the recommended ones;

automatic announcements are not transmitted;

calling subscriber (in case of automatic communication),

that has the category without access to automatic communication, is automaticaly connected to the operator of the central information desk, or receives "BUSY" tone.

2. After access code "8" is dialed it is allowed to transmit DIAL TONE from CO (OTLN) in the case of operation via CCS or if signals are transmitted by "pulse packet" method. In this case DIAL TONE from ATE is not transmitted.

3. In case of quasi-electronic, electronic CO interaction with ATE-5, OTLN, the decadic dialing from CO to ATE, OTLN should be transmitted only after DIAL TONE (from ATE) is received.

Table 7.3. Information acoustic signals for local communication.

State of connection	Signal
Off-hook:	DIAL TONE
CO devices are free	BUSY
CO devices are busy	
Dialing	RING_BACK_TONE to calling subscriber
subscriber line is free	RING - to called subscriber
subscriber line is busy	BUSY
lack of free devices or congestion	BUSY
Called subscriber answer	RING_BACK_TONE cancelation
Release:	
backward	BUSY to calling subscriber
forward	BUSY to called subscriber (in the ATC-47 exchange in the case of first party release calling subscriber receives the ANSWER signal)
End of payed period if conversation from local pay-phone	WARNING ABOUT THE END OF PAYED PERIOD

Note to Table 7.3.: In perspective exchanges the acoustic signals mentioned in p.7.5.2.5. are used in addition.

Table 7.4. Maximum allowable power of signal in the point with zero relative level

Signal frequency, Hz	Power	
	mkW	dB
800	750	-1
1200	500	-3
1600	400	-4
2000	300	-5
2400	250	-6
2800	150	-8
3200	150	-8

Table 7.5. Line signals, transmitted via toll, intrazonal and local networks.

Signal	Via toll netwrok trunks	Via intrazonal and local networks line	
		via toll trunk lines	via TL of local networks and OTL
1	2	3	4
In forward direction			
SEIZURE	+	+	+
AUTOMATIC CALL	–	+	–
REPEATED CALL	+	+	
DISCONNECTION	+	+	+–
RELEASE FORWARD	–	–	+
In backward direction			
ANI REQUEST	–	–	+
REQUEST REMOVAL	–	–	+
SUBSCRIBER IS FREE	+	+	–
ANSWER	+	+	+
RELEASE BACKWARD	+	+	+
BUSY	+	+	+
RELEASE			
BLOCK	+	+	+
IDLE STATE CONTROL	–	+	+

Notes:

1. ANI REQUEST and REQUEST REMOVAL signals may be transmitted repeatedly (via OTL up to 3 times).

Signals ANI REQUEST and REQUEST REMOVAL are not transmitted between quasi-electronic, electronic CO and ATE.

2. Signals BUSY, RELEASE, RELEASE FORWARD via TL, OTL and RELEASE via toll TL are not mandatory.

3. Signal RELEASE FORWARD is transmitted during called party controlled release.

4. At toll TL speech path devices are transfered into ANSWER state after ANSWER and BUSY signals.

5. It is allowed to transmit via toll trunk lines and trunks of toll network the RESET signal in the case of interaction with exchanges, that have the possibility to receive such signal.

Table 7.6. Line signals, transmitted via toll network for ATE or ASN interaction with ATE-1M, ATE-2, ATE-3 and with semiautomatic communication equipment.

Signal	Directtion	
	Forward direction	Backward direction
SEIZURE	+	–
REPEATED CALL, RESET	+	–
DISCONNECTION	+	–
READY TO CODE DIALING	–	+
READY TO NUMBER DIALING	–	+
SUBSCRIBER IS FREE	–	+
ANSWER	–	+
RELEASE (RING-OFF)	–	+
BUSY	–	+
RELEASE	–	+
BLOCK	–	+

Table 7.7. One Voice Frequency (2600 Hz) Signalling Code for the Toll Netwok

Signal	Construction	Duration, ms	Detection time, ms
FORWARD DIRECTION			
SEIZURE	One pulse	200+/-5	100-150
REPEATED	Series of pulses	Pulse 200+/-5 Pause	100-150
CALL, RESET		100+/-5	20-30
			120-180
DISCONNECTION	Continuous signal till the release signal detection	Minimum 550-850	280-420
BACKWARD DIRECTION			
SUBSCRIBER IS FREE AND ANSWER	One pulse(front of pulse "Subscriber is free", back of pulse - "ANSWER"	>=195	100-150
RELEASE (RING-OFF)	Series of pulses	Pulse 200+/-5 Pause 100+/-5	100-150 20-30 120-180
REPEATED ANSWER	Release (ring-off) cancellation	-	-
BUSY	Two-pulses	Pulse 200+/-5 Pause 100+/-5	100-150 20-30 120-180
RELEASE	Continuous signal till the disconnection signal cancellation	-	100-150 (it is detected after time out of disconnection sinal(550-850ms)
BLOCK	Continuous signal till the end of block (with 3 dB reduction of level	-	100-150

Notes:

1. 120-180 ms - detection time of the next pulse in the series of pulses.

2. If during 20-40 s. timeout after the start of DISCONNECCTION signal, RELEASE signal. Will not be received, than it is necessary to stop the continuous tranmission of DISCONNECTION signal and to start the transmission of this signal by pulses with duration 1000 ms and pauses with duration 5 min until the RELEASE signal detection.

3. In ATE-5 SEIZURE duration is 170-260 ms, REPEATED CALL, BUSY, RELEASE (RING-OFF) pulse duration is 170-230 ms, pause durtion is 90-130 ms.

Table 7.8. Bifrequency signalling code of signals transmission via toll network at frequencies F1-1200 Hz and F2-1600 Hz.

Signal	Construction	Duration, ms	Time Recognition, ms
1	2	3	4
FORWARD DIRECTION			
SEIZURE	F_2	Until ready signal detection	55 - 75
Called subscriber numb. (decadic code)	F_1	Pulse 33-79 Pause 31-71	
Repeated call of subscriber or toll switch board operator, reset	F_2	During the key depression	360 - 520
Disconnection	F_1 and F_2	Until release signal	490 - 710
BACKWARD DIRECTION			
Readiness to code dialing	F_1 and F_2	Until seizure signal cancellation	85 - 130
Redainess to number dialing	F_1 and F_2	≥ 200	50 - 100
Subscriber is free, or is connected to the toll switch board	F_1 and F_2	≥ 200, is transmitted until the answer of subscriber or operator	50 – 100
Subscriber or operator answer	SUBSCRIBER IS FREE signal cancellation		65 - 100
Subscriber or operator release(ring-off)	F_1 and F_2	Continuous signal	270 - 470
Repeated answer	RELEASE (RING_OFF) cancellation	–	65 - 100
Busy	F_1	≥ 200	50 - 100
Release	F_2	Until disconnection cancellation	100 – 170
Block	F_1	Continuous signal	60 – 100

Notes:

1. In bifrequency semiautomatic communication equipment duration of the last one in the series of decadic pulses may be 90-120 ms.

2. In ATE-5-10 the duration of pulses and pauses in the decadic code with V=9-11 pulses/s is to be (40-60) ms.

3. Time of interseries interval recognition should be no more than 400 ms.

Table 7.9. Single-frequency signalling code of line signals transmission via OTL at 2600 Hz

Signal	Construction	Duration, ms,	Время распознавания, мс
FORWARD DIRECTION			
Seizure	One pulse	200 ± 5	100 - 150
Called subscriber number (decadic code)	Series of pulses	Pulse 40-46 Pause 31-103 (with V=7-13 puls./s)	
Disconnection	Continuous signal until the release signal	Minimum 550-850	280 - 420
BACKWARD DIRECTION			
ANI request, answer	One pulse	200 ± 5	100 - 150
Request removal	Two pulses	Pulse 200 ± 5 Pause 100 ± 5	100 – 150 20 – 30 120 - 180
Release (ring-off)	Series of pulses	Pulse 200 ± 5 Pause 100 ± 5	100 – 150 20 – 30 120 - 180
Release	Continuous signal until the disconnection signal end	–	100 – 150
Block	Continuous signal until the end of the block state		100 – 150

Notes:

1. 120-180 ms. - time of recognition of the next pulse in the series of pulses.

2. If during 20-40s after the start of DISCONNECTION signal, RELEASE signal will not be received, than it is necessary to stop the continuous transmission of DISCONNECTION signal and to start the transmission of this signal by pulses with duration 1000 ms and pauses with duration 5 min until the RELEASE signal detection.

3. In ATE-5 duration of ANI REQUEST and ANSWER signals is 170-260 ms; REQUEST REMOVAL and RELEASE (RING-OFF) - pulse - 170-230 ms., pause - 90-130 ms.

4. Time of interseries interval recognition should be no more than 400 ms.

5. Duration of pauses in the decadic series depends on the speed of dialing from CO.

Table 7.10. Single frequency signalling code of line signals transmission via toll trunk lines at 2600 Hz.

Signal	Construction	Duration, ms,	Время распознавания, мс
FORWARD DIRECTION			
Seizure	One pulse	200 ± 5	100 - 150
Called subscriber number (decadic code)	Series of pulses	Pulse 40-46 Pause 40-60 (with V=9-11 puls./s)	
Repeated call reset	Series of pulses	Pulse 200 ± 5 Pause 100 ± 5	100-150 20-30 120-180
Disconnection	Continuous signal until the release signal receiving	Minimum 550-850	280-420
BACKWARD DIRECTION			
Subscriber is free	Continuous signal until answer	>=195	100-150
Answer	«Subscriber free» signal termination	-	-
Release (ring-off)	Series of pulses	Pulse 200 ± 5 Pause 100 ± 5	100 – 150 20 – 30 120 - 180
Repeated answer	Release (ring-off) signal termination	-	-
Busy	Two pulses	Pulse 200 ± 5 Pause 100 ± 5	100 – 150 20 – 30 120 - 180
Release	Continuous signal until the disconnection signal termination	–	100 – 150
Block	Continuous signal until the end of the block state	-	-

Notes:

1. 120-180 ms time of the next pulse recognition in the series of pulses.

2. If during 20-40 s time out after the DISCONNECTION start the RELEASE signal will not be received, than it is necessary to stop the DISCONNECTION continuous transmission and start transmission of this signal by pulses with duration 1000 ms and pauses with duration 5 min until the RELEASE signal detection.

3. In ATE-5 the duration of SEIZURE is 170-260 ms, REPEATED CALL - pulse - 170-230 ms., pause - 90-130 ms.

4. In ATE-3 the duration of SEIZURE is (80+/-16) ms., decadic dialing: pulse - 40-90 ms, pause - 36-60 ms.

5. Time of interseries interval recognition should no more than 400 ms.

Table 7.11. Signalling code of line signals transmitted via TL, OTL for CAS via one signalling channel.

Line signal	Direction of transmission		Time recognition, ms	Notes
	forward	backward		
1	2	3	4	5
1. Idle state control (RELEASE GEARD)				
2. Seizure 1 stage 2 stage	⟶	≤ 30 ms ⟵	of the 1 stage at incoming party is 8-30 or 8-200 for communication from systems that ensure interseries interval no less than 300 ms	the 2-d stage begins no later than in 30ms before the ANI receiver connection. In the case of backward signal lack (2 stage), the line block for is assured waiting signal with the forward transmission of conservation
2a. Busy	→→	←←		Additional line signal is not transmitted. BUSY tone is transmitted from incoming party via the speech path
3. Called subscriber number (decadic code)	$t_{(pls)}t_{ps}$ а) t_{ps}=43±3 ms t_{pls}=T – t_{ps} with V=10 – 13 pulses/s б) t_{pls}=63±3 ms t_{ps}=T – t_{pls} with V=7 – 8,5 pulses/s (example of implementation with corrector at the outgoing party)	←←	At incoming party no more than 20 for pulse and pause; no more than 400 for interseries interval; no more than 120 for detection of the end of decadic series	T(pls)=t (pulse) T(ps)=t (pause) Recognition time is given with respecy to existing outgoing equipment. It is possible to correct pulse as well as pause with speed 8,5-10 pulses/s Pause, in the case of it's forming, has duration 54-62 ms, General trnd for corrector: a) $K = \frac{t_{бт}}{t_{т}} \to 1$ b) Delay of the first pause transmission is to be no less than T (period)

Table 7.11 (cont.)

1	2	3	4	5
4. Answer or ANI request: 1 stage 2 stage Action if lack of 2 stage	→→ ⟶	⩽ 50 ms 130 ms	of 1 and 2 stages at incoming and outgoing parties is 8-30	Time of the 2 stage waiting at incoming party no less than 30 ms, for avoidance the RELEASE FORWARD (CALLING SUBSCRIBER RING-OFF signal imitation after answer
5. Release backward (ring-off) (request removal): 1 stage 2 stage	⟶	⩽30 ms	Of the 1 and 2 stages at outgoing and inco, ing and incoming party is 8-30	Time of the 2 stage waiting at incoming party is no less than 130 ms, to eliminate false disconnection after REQUEST |REMOVAL, RELEASE BACKWARD
6. Discon-nection after answer: 1 stage 2 stage 3 stage 4 stage	< 100 ms	> 130 ms	Of the 1 and 2 stages at incoming party is >130; of the 2 stage at outgoing party is <100; 3 and 4-th stages are without normalization	100 ms (2 stage) – for interaction with existing incoming equipment, that are released without outgoing party signal control removal
6a. Calling subscriber release (ring-off) after answer: 1 stage 2 stage 3 stage 4 stage			of the 1-st stage at incoming party is 8-30; of the2-nd is not normalized; of the3-d stage at incoming party is > 130ms; of the 4-th stage is not normalized	2-d stage begins after called subscriber release4-th stage corresponds to the idle state
7a. – Discon-nection before answer and after release backward (ring-off): 1 stage 2 stage		> 130 ms	of the 1-st stage at incoming party is 8-30; Beginning of the 2-d stage (line return in the idle state) is > 130 after the beginning of the 1-st stage	

Table 7.11 (cont.)

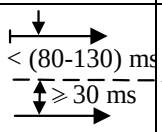
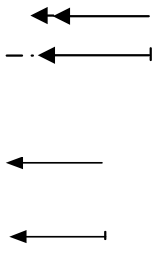
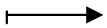
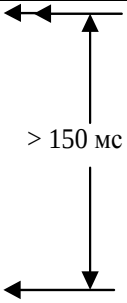
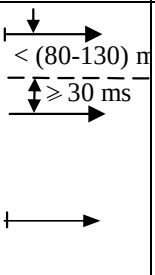
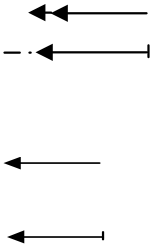
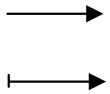
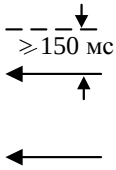
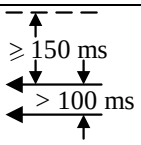
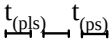
1	2	3	4	5
7b.Aligment of disconnection and answer 1 stage 2 stage (answer) 3 stage 4 stage 5 stage 6 stage			From the 3-d stage coincides with p.6., 6-th stage corresponds to the idle state to the return	At outgoing party after DISCONNECTION transmission (forward direction signalling channel is transfered into the passive state the ANSWER signal is expected during 80-130ms. With the last one arrival the passive state of channel mainta ins for no less than 30 ms, and channel is transfered into the active state. At in tive party after the first stage recognition (8-30) ms it is impossible to transmit - ANSWER via signalling channel
8. Block		←	At outgoing party depends on the equipment technical solution or is 20	

Table 7.12. Signalling code of line signals transmission
via toll trunk lines for CAS via one signalling channel.

Line signal	Direction of transmission		Time recognition, ms	Notes
	forward	backward		
1	2	3	4	5
2. Idle state control				
2. Seizure 1 stage 2 stage	⟶	≤ 30 ms ⟵	of the 1 stage at incoming party is 8-30 or 8-200 for communication from systems that ensure interseries interval no less than 300 ms	the 2-d stage begins no later than in 30 ms before the ANI receiver connection. In the case of backward signal lack (2 stage), the line block for is assured waiting signal with the forward transmission of conservation
3. Called subscriber number (decadic code)	$t_{(pls)}$ t_{ps} a) t_{ps}=43±3 ms t_{pls}=T – t_{ps} with V=10 – 13 pulses/s б) t_{pls}=63±3 ms t_{ps}=T – t_{pls} with V=7 – 8,5 pulses/s (example of implementation with corrector at the outgoing party)	⟵	At incoming party no more than 20 for pulse and pause; no more than 400 for interseries interval; no more than 120 for detection of the end of decadic series	T(pls)=t (pulse) T(ps)=t (pause) Recognition time is given with respecy to existing outgoing equipment. It is possible to correct pulse as well as pause with speed 8,5-10 pulses/s Pause, in the case of it's forming, has duration 54-62 ms, General trnd for corrector: a) $K = \frac{t_{бт}}{t_{т}} \to 1$ b) Delay of the first pause transmission is to be no less than T (period)

Table 7.12 (cont.)

1	2	3	4	5
4. Answer or ANI request: 1 stage, 2 stage Action if lack of 2 stage	→→ ⟶	50 -70	of 1 and 2 stages at outgoing party; start of signal-during 8-45; end of signal-during 120-200 from it's start	At outgoing party the signal interrupti on in trunk at 50-120ms is detected as SUBSCRIBER IS FREE.
5 Subscriber line is busy or congestion	→→	←	120-200 at outgoing party	SUBSCRIBER FREE signal retransmission is allowed without recognition with condition rthat duration of the false signal of the subscriber line business is <=80ms
5a Subscriber is free after subscriber is busy	→→	←	8-35 at outgoing party	
6 Ring (automatic and repeated)	$t_т$ $t_{бт}$	←←	8-25 at incoming party	t (pls) and t (ps)= 40 ±5 ms
7a Answer: 1 stage, 2 stage Action if the 2-d stage lack	→→ ⟶ - -	⩽30 ms > 130 ms	Both stages at incoming and outgoing parties are 8-30	ANSWER signal sho-| uld be transmitted in pulse as well as in pause of RINGING signal. Waiting of backward signal at incoming party (of forward direction signalling Channel transfer into the passive state) is during >=150 ms (time of recognition of RELEASE FORWARD (calling subscriber ring- off) signal if it coincides with ANSWER).ANSWER signal always follows Subscriber IS FREE signal
7b Transi-tion from SUBSCRIBER IS BUSY State into Answer state: 1 stage, 2 stage, 3 stage	→→ ⟶ - -	⩾40 ms ⩾ 150 ms	Of the 1-st stage at outgoing party is 8-35 (SUBSCRIBER IS FREE signal); of the 2-d and 3-d stages is 8-30	
8 Release backward (called subscriber ring-off): 1 stage, 2 stage	⩽30 мс (130 м	- - -←	of the 1-st stage at outgoing party is 8-30	Time in brackets is given with respect to existing outgoing equipment Waiting of the 2-d stage at incoming party is >=150 ms (DISCONNECTION signal recognition

1	2	3	4	5
9 Discon-- 1 этап nection in the “subscriber line is free “state and in the SEIZURE state a)2 stage (return into the idle state)			of the 1-st stage at incoming party is 8-30. Beginning of the2-d stage (channel return into the idle state) in >=150 after	At outgoing party after DISCONNECTION signal transmiss. (transfer into the passive state)- waiting of the ANSWER signal during 80-130ms. If the last one arrival - conservation of the passive state of signalling cha nnel in forward direction additional at no less than 30ms,and then channel is transfered into the active state. At incoming party there is no possibility to transmit ANSWER via signalling channel after the1-st stage recognition (8-30ms).
1 stage Discon- 2 stage nection- (answer) and an- 3 stage swer coin- 4 stage cides 5 stage 6 stage			From the 3-d stage coincides with p.10 6-th stage corresponds to the channel return into the idle state	
1	2	3	4	5
10. Discon- 1 stage nection 2 stage after 3 stage answer 4 stage			Of the 1-st stage at incoming party is ≥150 2,3,4-th stages are not normalized. 4-th stage corresponds to channel transmittion into the idle state	
11.Discon- 1 stage nection if- 2 stage the sub- 3 stage scriber line is busy			Of the 1-st stage at incoming party is 150-220, 2-d stage at outgoing party - no more than 50, 3-d stage is not normalized (corresponds to the idle state)	2-d stage begins after release of the incoming CO devices.Limitation of the upper limit of the 1-st stage recognition (220ms) is necessary for interaction with existing outgoing equipment, that releases in 250ms after DISCON-NECTION signal
12. Reset			At incoming party is 8-25	t (pls) and t (ps)= 40 ±5 ms
13. Block		⟵	At outgoing party depends on the equipment technisolution or is ≥ 20	See 7.4.3.7

Notes to Tables 7.11. and 7.12.:

1. Symbols:

---->--> signalling channel active state continuation from the previous stage;

-------> signalling channel transition into the active state;

------> signalling channel transition into the passive state.

2. Stages of line signal transmission have to determine the sequence of signalling channels state change in forward and backward directions;

3. Signalling channels receivers have to provide the noise discrimination for up to 8 ms;

4. It is allowed to receive the backup signal as a zero potential (earth) via the special wire. To receive this signal it is necessary to transfer all the outgoing party telephone channels into the "block" state. Backup signal should be realized by groups, 10 channels in each group.

5. Any change of incoming party line signalling after the ANSWER or SUBSCRIBER IS BUSY states should assure the backward transmission of signal.

6. At outgoing party transition from "seizure" state into the line block state, while waiting the backward signal, is performed at one of the stages of connection establishement:

- when the first decadic pulse arrival;
- after disconnection;
- after the end of the timeout.

BUSY tone is sent to the calling subscriber if it is necessary.

Table 7.13. Three wire physical trunk signalling code via TL, OTL, using decadic pulses.

Signal	Transmission direction &wire used	Wires end of trunk								Recognition Time (ms)	Note
		Outgoing end of trunk									
		a	b	C Outgoing junctor	D Step-by-step	a	b	C Interaction with outgoing junctor	D Interaction with step-by-step ex.		
1	2	3	4	5	6	7	8	9	10	11	12
Idle state control	← C	Insulation	Insulation	"+" through 20 000 KOhm	Insulation	"-" through 1000 Ohm	"+" through 1000 Ohm	"-" through ≤1300 Ohm	"-" through 350 Ohm 350 Ohm 1050 Ohm (depending on Rtl)	≥10, if trunk line resistance Rtl=0 Ohm & ≤40, Rtl>0 Ohm	
Seizure	C →	"-" through 4200 Kohm ± 10%	"+" through 1000 Ohm ± 10%	"+" through 0 Ohm	"+" through 1065 Ohm with transition at "+" through 650 Ohm					8 - 70 number receiver connection time included	Incoming party "c" wire change of state during the interaction with step-by-step exchange starts after positive polarity through 65 Ohm recognition, or no sooner than after 17 ms since a seizure
	← C							-"-" through ≥1300 Ohm	"-" through Rin+600 Ohm		
Called subscriber number (decadic code)	A B →	Импульс "+" through 500 Ohm	"-" through 500 Ohm	"+" through 0 Ohm	"+" through 65 Ohm	"-" through 1000 Ohm	"+" through 1000 Ohm	"-" through ≥ 1300 Ohm	"-" through Rвх + 600 Ohm	10-30 for pulse and pause; no more 400 for interval between series; no ledd than 120 ms for ring off and serial devices	Detection time for electronic receivers is no less than 20 ms, Receiver shouldn't react at the "jar" of the signal for up to 4 ms. The work of ring off & serial devices should take place when signal duration exceed 30 ms; possibility of dial pulses reception only via "a" wire Should be provided. Receiver should be put into operation by I=3,5 mA in each wire Should be provided. Receiver should be put into operation by I=3,5 mA in each wire
		c=0,5 мкф pause: insulation C=0,5 mkF									
Answer, ANI request	←	"-" through 42 KOhm	"+" through 1 KOhm			"+" through 1 KOhm	"-" through 200 KOhm			20-90	Duration distortion of ANSWER (ANI REQUEST), REQUEST REMOVAL signals transmission, or of retransmission from 20 to
ANI Request removal	A ←	"-" through ≥ 42 KOhm	"+" through 1000 Ohm			"+" through 1000 Ohm	"-" through 200 000 Ohm				

Table 7.13 (cont.)

1	2	3	4	5	6	7	8	9	10	11	12
	A ←	"-" through ≥42000 Ohm	"+" through 1000 Ohm	"+" through 0 Ohm	"+" through 65 Ohm	"-" through 1000 Ohm	"+" through 1000 Ohm	"-" through ≥1300 Ohm	"-" through RBX +600 Ohm	≥ 200	
Called subscriber ring-off (if first busy)	A B					"+" through 200 000 Ohm	"-" through 1000 Ohm			≥ 200 for “a” ≥5 for “b” wire	
Calling subscriber ring-off after the answer (if first)	A →	"-" through 1000 Ohm	"+" through 1000 Ohm			"+" through 1000 Ohm	"-" through 200 000 Ohm			≥ 80, considering defence from :”a” & “b” wires polarity reversal	Signal is transmitted for the bilateral ring-off, signal receiver should seize its work when I=6,5 mA
Disconnection In any state	C →	Insula-tion	Insula-tion	"+" through ≥ 20 000 Ohm	Insula-tion	Depends on the stage				(2-8) if Rtl=0 ≥ 200 if Rtl>0	“c” wire receiver seizes its work when control circuit resistance is 8 kOhm & U=74V, Transitio to the idle state after the incoming exchange devices liberation
Transition to the idle state	C →					"-" through 1000 Ohm	"+" through 1000 Ohm	"-" through ≤1300 Ohm	"-" through ≤350 Ohm		
Block	C ←	Insula-tion	Insula-tion	"+" through ≥20 000 Ohm	Insula-tion	"-" through 1000 Ohm	"+" through 1000 Ohm	Insula-tion	Insula-tion	≥ 25	Busy line block should not lead to disconnection

Table 7.14. Three wire physical trunk signalling code via toll trunk lines, using decadic pulses.

Signal	Transmission direction & wire	Wires state								Detection time (ms)	Note
		Outgoing side									
		A	B	C Work with outgoing junctor	C Work with step-by step exchange	A	B	C Work with outgoing junctor	C Work with step-by-step ex.		
1	2	3	4	5	6	7	8	9	10	11	12
Idle State control	C →	insulation	insulation	"+" through >20 000 Ohm	insulation	"-" through 1000 Ohm	"+" through 1000 Ohm	"-" through ≤1300 Ohm	"-"through 350 Ohm 550 Ohm 1050 Ohm	≥10, if trunk line resistance Rtl=0 and ≤40, if Rtl>0 Ohm	
Seizure	C →	"-" through ≥40000 Ohm	"+" through ≥40000 Ohm	"+" through 0 Ohm	"+" through 1065 Ohm with transition at "+" through 65 Ohm					8-70 with the ANI receiver connection time included	Incoming party "c" wire change of state during the interaction with step-by-step exchange starts after positive polarity through 65 Ohm recognition, or no sooner than after 17 ms sice a seizure
	← C							"-" through ≥1300 Ohm	"-" through Rin+600 Ohm		
		Pulse:									
Called sudscriber number (decadic code)	A B →	"+" through 500 Ohm C= 0,5 mkF Pause: insulation. C=0,5 mkF	"-" through 500 Ohm C= 0,5 mkF Pause: insulation. C=0,5 mkF	"+" through 0 Ohm	"+" through 65 Ohm	"-" through 1000 Ohm	"+" through 1000 Ohm	"-" through ≥13000 Ohm	"-" through Rin+600 Ohm	10-30 for pulse and pause; for interseries interval no less than 400; for ring-off and serial device no less than 120	Detection time for electronic receivers is no less than 20 ms, protection from "jingle" (signal interruption) 4 ms, possibility of dial pulses reception only via "a" wire should be provided. Receiver should be put into operation by I=3,5 mA, in each wire
Subscriber is free, ring-off	A B ←	"-" through ≥ 40000 Ohm	"+" through ≥ 40000 Ohm			"+" through 1000 Ohm	"-" through 1000 Ohm			200-with taking into account the possibility of arrival via wire in different time up to 100	

Table 7.14 (cont.)

1	2	3	4	5	6	7	8	9	10	11	12
Ring	B →	"-" through ≥ 40000 Ohm	"+" through 0-60 Ohm	"+" through 0 Ohm	"+" through 65 Ohm	"+" through 200 000 Ohm	"-" through 200 000 Ohm	"-" through ≥ 1300 Ohm	"-" through Rin+600 Ohm	80-500 with taking into account the receivers protection from “a” and “b” wires polarity reversal	Incoming party signal receivers should seize their work when I=6,0 mA in any wire, while the other one is switched off
Ring	A ← B	"-" through ≥ 40000 Ohm	"+" through ≥ 40000 Ohm							50-110	The possibility of ANSWER signal receiving during the CALL transmission should be assured
Answer	A ← B					"+" through 200 000 Ohm	"-" through 1000 Ohm			No less than 200	
Busy	B →	"-" through ≥40000 Ом	"+" through 0-60 Ом							80-500 among with the “a” and “b” wires polarity revesal	Duration of interference causes by CALL and RESET signals receivers no more tham 300 ms
Disconnection at any stage of connection Transition to the idle state	C → C ←	insulation	insulation	"+" through >20000 Ом	insulation	Depending on the stage of connection "-" through 1000 Ом	"+" through 1000 Ом	"-" through ≤1300 Ом	"-" through ≤350 Ом	No less than 8 if Rtl=0; no less than 20 if Rtl>0	Seizure signal receiver should seize if resistance is more than 8000 Ohm and U=74 V
Block	C ←							insulation	insulation	No less than 25 or in correspondance with p.7.3.4.7.	Busy line block should not cause the disconnection

Notes to tables 7.13 and 7.14:

1. Trunk line equipment should operate with the following most unfavourable values of parameters

- trunk line resistance 0 - 1.5 kOhm (TL, OTL) 0 - 1.0 kOhm (toll TL);
- "a" wire to ground insultation resistance is 50 kOhm, other wires - 150 kOhm;
- power voltage range is 50 - 74 V with ground potentia difference +/- 8 V, exchange voltage is 54 - 72 V;
- remaining current of the electronic devices over "a", "b" and "c" wires are 0.3 mA.

2. The nominal values of parameters are shown in the tables.

3. All devices should operate in presence of the voltage with amplitudes up to 250 V on "a" and "b" wires during transmittion processes in realy equipment. Voltages can be clipped with working zone limits -90 V/+15 V.

4. There should be provided defence of devices, connected to "a", "b" and "c" wires from the ground and "minus 60" potentials without use of limiting resistors at any stage of connection.

5. Transmission of the signals, havong level minus 32 dB should be provided through any contacts contained in the speech path. Contact resistance shold be no more than 1 kOhm.

6. All devices connected to "a" and "b" wires should retain operating conditions if there are signals having efficient voltage up to 110 V and frequency -25 Hz at these wires, and duration of pulse -1s, pause -4 s. To "a" wire these voltage can be applied alongside with the 60 V d.c. of the exchange battery, and to "b" wire relative to the ground.

The sourse of this signal is the ringing generator of the exchange with low output impedance connected via a transformer with primary resistance equal to 1 Ohm and the secondary one equal to5 Ohm.

7. Remaining currents of the electronic devices connected to thee trunk line wires shouldn't exceed 0.3 mA.

8. The possibility of the reverse direction current flow should be excluded in the transmission abccence in order to avoid high impedance receivers operation due to the ground potentials difference and exchange supply batterries potential difference.

9. Input impedance of the "c" wire receiver (Rin) of the step-by-step exchange should be more than 560 Ohm together with the line reistance. If "c" resistance is less than 700 Ohm than it is permitted to augment Rin to make the total impedance 700 Ohm.

10. If the interaction with the systems, providing the interval between dial pulses series to be more than 300 ms.

11. Some parts of TL, OL can be equipped with dial pulses transmitters lacking 500 Ohm resistors. There can be other decisions, concerning dial pulses transmission if setted.

12. Toll trunk line devices should receiv RING signal in both cases when positive polarity over "b" wire and minus 60 V over "a" wire RING and RESET signals have to be received when they are connected to the line through 500 Ohm (in addition to the line resistance).

13. When SUBSCRIBER IS FREE signal receiving from exchange devices the non-simultaneous polarity receiving via "a" and "b" wires should not exceeds 100 ms.

14. Duration of transition process when speech path switching after the decadic dialing should not exceed not exceeds 10 ms.

7.15. Code for line signals transmission via four-wire physical OTL for direct current loop signalling

Signal	Outgoing for transmission		Incoming for receiving		Outgoing for reception		Incoming for transmission	
	e	f	$e_{(1)}$	$f_{(2)}$	a	b	$a_{(3)}$	$b_{(4)}$
1	2	3	4	5	6	7	8	9
Idle state control	Loop make through 15800 Ohm		«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 15800 Ом		«-» through 500 Ohm	«+» through 500 Ohm
Idle state control	Loop make through 15800 Ohm		«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 30 Ohm		«-» through 500 Ohm	«+» through 500 Ohm
Seizure	Loop make through ≥ 200000 Ohm For given dorection of current		Wires polarity reversal «-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 30 Ohm			
Subcriber Number (decadic code)	Pulsing «-» through 500 Ohm	«+» through 500 Ohm	«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 30 Ohm		«-» through 500 Ohm	«+» through 500 Ohm
Answer, ANI request AOH	Loop make through ≥ 200000 Ohm For given direction of current		«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 500 Ohm		Wires polarity reversal «+» through 500 Ohm	«-» through 500 Ohm
ANI requesy removal AOH	Loop make through ≥ 200000 Ohm For given direction of current		«+» through 1000 Ohm	«-» through 1000 Ohm	Loop make through 30 Ohm		Wires polarity reversal «-» через 500 Ohm	«+» через 500 Ohm
Call subscriber ring-off (release), busy	Loop make through 15800 Ohm		Wires polarity reversal «-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 30 Ohm		Wires polarity reversal «-» through 500 Ohm	«+» through 500 Ohm

Tabl 7.15 (cont.)

<table>
<tr><td>1</td><td colspan="2">2</td><td>3</td><td colspan="2">4</td><td>5</td><td colspan="2">6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td rowspan="2">Discon-
nection</td><td colspan="3">≥ 200000 Ohm for given direction of current</td><td colspan="2">«+» through 1000 Ohm</td><td>«-» through 1000 Ohm</td><td colspan="3">Loop break</td><td rowspan="2">«-» through 500 Ohm</td><td rowspan="2">«+» through 500 Ohm</td></tr>
<tr><td colspan="3">Loop make through 15800 Ohm</td><td colspan="2">Wires polarity reversal
«-» through 1000 Ohm</td><td>«+» through 1000 Ohm</td><td colspan="3">Loop make through 15800 Ohm</td></tr>
<tr><td>Блокировка</td><td colspan="3">Loop make through 15800 Ohm</td><td colspan="3">Wires polarity removal</td><td colspan="3">Loop break</td><td colspan="2">Wires polarity removal</td></tr>
</table>

Note to column a(3) and b(4). Additional 500 Ohm resistance is introduced for short lines.

Table 7.16. Signalling code for line signals transmission via four-wire physical toll trunks for dirrect current loop signalling.

Signal	Outgoing for transmission		Incoming for reception		Outgoing for reception		Incoming for transmission	
	$e_{(1)}$	$f_{(2)}$	e	f	$a_{(3)}$	$b_{(4)}$	a	b
1	2	3	4	5	6	7	8	9
Idle state control	Loop make through 15800 Ohm		«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 15800 Ohm		«-» through 500 Ohm	«+» through 500 Ohm
Seizure	Loop make through 15800 Ohm		«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through ≤ 130 Ohm			
	Loop make through ≥ 200000 Ohm For given direction of current		Wires polarity reversal «+» through 1000 Ohm	«-» through 1000 Ohm	Loop make through ≤ 130 Ohm		«-» through 500 Ohm	«+» through 500 Ohm
Called Subscriber number (decadic code)	Pulsing «-» through 500 Ohm	«+» through 500 Ohm	«+» through 1000 Ohm	«-» through 1000 Ohm	Loop make through ≤ 130 Ohm		«-» through 500 Ohm	«+» through 500 Ohm
Subscriber free	Loop make through 15800 Ohm		Wires polarity reversal «-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 500 – 1000 Ohm		Wires polarity reversal «+» through 500 Ohm	«-» through 500 Ohm
Ring	Loop make and break through 30 Ohm		«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through 500 – 1000 Ohm		«+» through 500 Ohm	«-» through 500 Ohm
Answer	Loop make through ≥ 200000 Ohm		Wires polarity reversal		Loop make through ≤ 130 Ohm		Wires polarity reversal	
	For given direction of current		«+» through 1000 Ohm	«-» through 1000 Ohm			«-» through 500 Ohm	«+» through 500 Ohm
Called subscriber ring-off (release backward)	Loop make through 15800 Ohm		Wires polarity reversal «-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through ≤ 130 Ohm		Wires polarity reversal «+» through 500 Ом	«-» through 500 Ом

Table 7.16. Signalling code for line signals transmission via four-wire physical toll trunks for dirrect current loop signalling.

Table 7.16 (cont.)

Signal	Outgoing for transmission		Incoming for reception		Outgoing for reception		Incoming for transmission	
	$e_{(1)}$	$f_{(2)}$	e	f	$a_{(3)}$	$b_{(4)}$	a	b
1	2	3	4	5	6	7	8	9
BUSY	Loop make through 15800 Ом		Wires polarity reversal		Loop make through ≤ 130 Ohm		Wires polarity reversal	
			«-» through 1000 Ohm	«+» through 1000 Ohm			«-» through 500 Ohm	«+» through 500 Ohm
Reset	Loop make throug 30 Ohm		«-» through 1000 Ohm	«+» through 1000 Ohm	Loop make through ≤ 130 Ohm		«-» through 500 Ohm	«+» through 500 Ohm
Disconnecti on	Loop make through 15800 Ohm		«+» through 1000 Ohm	«-» through 1000 Ohm	Loop make through		«-» through 500 Ohm	«+» through 500 Ohm
Release			Wires polarity reversal		Look make through 15800 Ohm			
			«-» through 1000 Ohm	«+» through 1000 Ohm				
Block	Loop make through 15800 Ohm		Wires polarity removal		Loop break		Wires polarity removal	

Note to columns a and b: for short lines the additional 500 Ohm resistance is introduced.

Table 7.17. Code of line signals transmission via physical two-wire trunks for loop signalling.

Signal	Transmission direction	Wires state				Detection time, ms	Note
		Outgoing party TL		Incoming party TL			
		a	b	a	b		
1	2	3	4	5	6	7	8
Idle state control	←	Loop through R≥16000 Ohm for current direction from “b” to “a”		“-“through 1000 Ohm	“+“through 1000 Ohm	At outgoing party is no less than 8 or 40	“Idle state” detection time is 40 ms-for the case when seizure unit connected into the control circuit via TL
Seizure	→	Loop through R≤300 Ohm for direction of curent from “b: to “a” (loop through R≤1000 Ohm for current from “a” to “b” is ready)				At incoming party, including the time for number information receiver connection, is 8-70 or 8-200 (if connection from sysytems from ensure interseries interval no less than 300 ms and constant, untill disconnection SEIZURE signal transmission)	Receiver of signals via “a” and “b” wires of incoming party should operate with R=1 kOhm ans should be switched off if R=16 KOhm (TL parameters are considered additionaly). Loop through R<1000 Ohm for current from “a” to “b”-is preparation for ANSWER signal receiving
Called subscriber number (decadic code)	- - -	infinity		infinity			Reception of pulses transmitted by battery as well as by loop way should be ensured at incoming party simultaneously
Signal (pause)	C=0,5 MkF To ground	C=0,5 MkF To ground		“-“ through	“+” through	Incoming party receives of pulse and pause with duration from	Loop way of trans mission is allowed for common power supply of outgoing and incoming

Table 7.17. (cont.)

1	2	3	4	5	6	7	8
Signal (pulse) two ways of transmission a. transmission time parameters for correction at outgoing (ex. O implementation		1. "+" through 500 Ohm 2. Loop through R≥300 Ohm for current from "b" to "a" t_{pls}=(43±3) ms $t_{ps}=T-t_{pls}$ if V=10-13 pulses/s t_{ps}=(63±3) ms $t_{pls}=T-t_{(ps)}$ if V=7-8, 5 pulses/s	"+"through 500 Ohm			38 to 115; protection from pause and pulse noise-10; (for electronic) receivers-20); ring-off and series cancellation detection is no less than 120; (preparation stage is no ledd than 30) interseries interval recognition is no less than 400	Trunk line equipment. The following recommendations should be implemented at the outgoing party for the goal of pulses correction; if V=8,5-10 pulses/s, than it is possible to-correct pulse as well as pause $T_{ps}/t_{pls}\longrightarrow 1$
b. transmission time parameters without correction at the outgoing TL party		T(ps)=(61-83) ms T(pls)=(50-72) ms If V=7-7,5 pulses/s T(pls)=t(ps_=(32-49) ms if V=12,5-13 pulses/s					Current pulse (first and last) in the case of its formation lies withing the boundaries 54-62 ms. Delay of the first current pulse transmission is no less than half of the receiving pulses period duration
Answer (ANI request)	←	Loop through R>600 Ohm from "a" to "b" and through		"+" through 1000 Ohm	"-" through 1000 Ohm	8-30 at outgoing party	Request and request removal may be transmitted multiple.
Called subscriber ring-off (request removal)	←	R<300 Ohm for current from "b" to "a"		"-" through 1000 Ohm	"+" through 1000 Ohm	8-200 at outgoing party	Allowed signals duration distortion are from –200 Ohms to +150 Ohms
Calling subscriber ring-off	→ → ←	If t=50-60 ms loop through R>16 kOhm for current from "a" to "b"		"+" through 1000 Ohm	"-" through 1000 Ohm	No less than 8-30 at incoming party	If incoming impedance of receiver at outgoing party is R=45-60 kOhm, than loop break at 50-600 ms is removed
Called subscriber release after calling subscriber ring-off	← ←	Loop through R>16 kOhm from current from "a" to "b"		Infinity Infinity "-" through 1000 Oh	Infinity "+" through 1000 Ohm "+" through 1000 Oh	At outgoing party is no less than 8 or 40	For unilateral ring-off system the CALLED SUBSCRIBER REKEASED signal is formed at incoming party automaticaly, after CALLING SUBSCRIBER RELEASE signal reception

Table 7.17. (cont.)

1	2	3	4	5	6	7	8
Disconnection in the pre-answer state	→	Infinity if t=300-600 ms		"-" through 1000 Oh	"+" through 1000 Oh	120-260 at incoming party	Duration of stage is 120-260 ms (the upper limit may be increased)
	←			Infinity	Infinity Or "+" through 1000 Oh		Duration of stage is defined at incoming party by the time of the idle stage restoration
	←	Loop through R≥16 kOhm for current from "b" to "a"					
Block		Loop through R≥16 kOhm for current from "b" to "a"		Infinity	Infinity Or "+" through 1000 Oh		

Note: 1. Remaining current of electronic devices connected to "a" and "b" wires should not exceeds 0.3 mA.

2. Conditions of receivers operation and lack of operation should be defined considering ultimate unfavourable values of parameters.

3. For short trunk lines it is allowed to stabilite current in the loop.

Table 7.18. Code of line signals transmission via TL and OTL for CAS using two signalling channels (SC).

Signal	Transmission direction				Recognition time, ms	Note
	Forward		Backward			
	ISC	IISC	ISC	IISC		
1	2	3	4	5	6	7
Idle state control (RELEASE GUARD)			←			This signal doesn't need the upper limit of the time of recognition
Seizure 1 stage 2 stage		→	←---←--- ←		Depends on the recognition time of the channel's change	Incoming party generates acknowledgment signal in (14-25) ms
Called subscriber number (decadic code)	— →	→→			At incoming party: Duration of the received pulse and pause is from 17 (21) to 120; interseries initerval is no less than 400; Disturbances discrimination depends on detcition time of the the SC state change	
Answer (ANI request)		→→		←	Depends on the time of recognition of SC state change	Time of ANSWER, ANI REQUEST signal recognition is no more than 90 ms
Request removal		→→		←		
Called scriber release (ring-off)		Any state	←	←←		signal recognition is no more than 90 ms
Calling subscriber release ring-off after answer	→	→→		←←	Depends on the time of recognition of SC state change	Is used at network with bilateral ring-off system (called part controlled release)

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Table 7.18. (cont.)

1	2	3	4	5	6	7
Subscriber line is busy or congestion		→	←	←		Overtaking if signal transmission via the IISC in comparaison with the ISC should be no more than 4 ms
Disconnection at any stage of connection Transition to the idle state		→	Any state ←	Any state	Depends on the time of detection of SC state shange and reaction on failures	
Block			←		Depends on the time of recognition of SC state shange	

Table 7.19. Signalling code of line signals transmission via toll trunks for CAS via two signalling channels (SC).

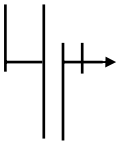
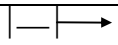
Signal	Direction of transmission				Recognition time, ms	Note
	Forward		Backward			
	1 SC	2 SC	1 SC	2 SC		
1	2	3	4	5	6	7
Idle state control			←		Depends on the SC change of state recognition time	This signal doesn't need the repper limits of recognition time
2 Seizure 1 stage 2 stage		←	← ←			The acknowledgment signal is formed at the incoming party within 14-25 ms
3. Called subscriber number (decadic code)		→			At incoming party should detect of pulse and pause with duration from 17 (21) to 120; protection from noises depends on the SC change state recognition time. Interseries interval recognition time is no more than 400	Pulses psrsmeters at SC input should lie within the range: Pulse 22-110 ms Pause 22-90 ms
4 Subscriber free or called subscriber release (ring-off)		→	←			
5 Ring		→	←		Depends on the recognition time of SC State change	The possibility should be foreseen of ANSWER reception simultaneously with the ring signal transmission
6 Answer		→	←			
7 Subscriber line is busy or congestion		→	←	←		The signal transmission via the 1-st channel can start 4 ms earler than via the 2-nd one.
8 Reset						

Table 7.19. (cont.)

1	2	3	4	5	6	7
9 Discon-nection at any stage transition to the idle state		⟝	Any state	Any state	Depends on the SC change of state recognition time and failure detection and response system	
10 Block			⟵|		Depends on the SC change of state recognition time	

Notes to table 7.18 and 7.19

1. Symbols:

→→ Continuation of the active state of the signalling channel from the previous stage.

⟶ Transition of the signalling channel into the active state.

⟝⟶ Transition of the signalling channel into the passive state.

2. The detection time of SC change of state is 14-20 ms and it is preferable to provide two grades (14-16 ms and 18-20 ms) of the detection time.

3. If SC state doesn't correspond tothe signalling code or distort the sequence of line signals transmission, than it is appropriate to transfer the incoming devices of TL, OTL, TTL into the "disconnection" state, the outgoing devices of TL, OTL into the preansurer state, and outgoing devices of TTL into the "subscriber is free" state.

Table 7.20 Signalling code of line signals transmission via universal TL of two-way operation with the use of one associated signalling channel (1SC) and the second (2SC) one in the speech spectrum, or with the use of two associated SC.

Local connection.

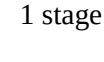
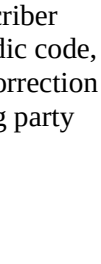
Line signal	Direction of transmission				Recognition time, ms	Notes
	Forward		backward			
	1SC	2SC	1SC	2SC		
1	2	3	4	5	6	7
1 Idle stet control		→→		←←	No less than 10 (time, that necessary for the 2-nd receiver)	The signal doesn't need the upper limit of recognition time
2. Seizure 1 stage		↦		←←	At outgoing end no more than 30. At incoming end – (10-30), 10-200 for communication from systems, that quarantee the interdigit interval	Block from the oncoming connection seizure. Transmission via the ISC in 40-80 ms after the cancelation of transmission via the 2SC causes the SEIZURE signal translation. In the case of the 3-d stage lack, line is blocked for waiting the 3-d stage with forward direction transmission via the ISC conservation
2 stage	40-80 ms	- - - - -	- - - - -	- - - - - -		
3 stage	→→	-	-	⩽ 30 ms		
3 Called subscriber number (decadic code, example for correction at the outgoing party	 $t_{бт}$=45±3мс $t_т$=T - $t_{бт}$ a				At incoming party 10-25 for pulse and pause; No more than 400 for interdigit interval; no more than 120 for serial and ring-off device if duration of signal, that's necessary for start of operation of these devices is more than 30	1/ At the output of existing outgoing equipment, at the speed 7-13 pulses/s t(pls)=25-106 ms; t(ps)=35-52 ms;2. At the incoming party it is necessry to take into consideration the possibility of pulses arrival before the cancelation of transmission via the 2SC by the incoming party
4. Answer (ANI request)	→→	←			At outgoing party is 10-30	
5.Called subscriber ring-off (request remove)	→→	⟵			At outgoing party is 10-30	

Table 7.20 (cont.)

Local connection.

1	2		3	4	5	6	7
6. Disconnection 1 stage answer and 2 stage return to 3 stage the idle state	⟼	→ ←	←← ⟻			At outgoing party is 10-30	After release of incoming equipment; 1. Transmission via 3SC from outgoing party goes after cancelation of transmission via 1SC from incoming party and release of outgoing equpment but not earlier than in 20 ms after the cancelation of transmission via 2SC from outgoing 2. Transmission via the 2SC starts fromincoming party vafter restoration of control circuit, but not earlier than in 20 ms after the cancelation of transmission via 2SC.
7. Disconnection 1 этап before answer 2 этап or after ring-off of called subscriber and return into he idle state	⟼	→ ←				At incoming party is 120-150	
8. Disconnection-simultaneously 1 этап with the 2 этап answer 3 этап 4 этап	⟼	→ ←	← ⟻			At incoming party cancelation of transmission via 1SC is ≤30 ms	At outgoing party waiting of ransmission via 1SC is done during 80-120 ms. In the case of cancelation of transmission via 2SC from outgoing party through ≤30 ms, at incoming party the ANSWER signal transmission into the channel is eliminated. Outgoing party starts the transmission via the 2SC through 80-120 ms (if answer lack) or after cancelation of transmission via 1SC from incoming party.
9. Channel block a) for outgoing communication b) b) for incoming communication		→→ ⟼		⟻ ←←		At outgoing and incoming party is ≤30 ms	

Table 7.20 (cont.)

Toll connection.

Line signal	Direction of transmission				Recognition time, ms	Notes
	Forward		backward			
	1SC	2SC	1SC	2SC		
1	2	3	4	5	6	7
1. Idle state control		→→		←←	No less than 10 (time, that necessary for start of operation of the 2SC receiver)	
2. Seizure 1 stage	→	→→		←←	At outgoing party no less than 30. At incoming party-(10-30). If operation with systems that quarantee the interdigit interval no less than 300 ms, the oncoming party can recognize the 10-200 ms seizure signal	If lack of the 2-d stage line is blocked for waitingthis stage with reservation of transmission via 1SC and 2SC in forward direction
2 stage	→→	→→		⟵		
3 stage	→→	⟼				
3. Called subscriber number (decadic code, example for correction at the outgoing party))	$t_т$, $t_{бт}$, $t_{бт}$=45±3мс $t_т$=T - $t_{бт}$				At incoming party 10-25 for pulse and pause; No more than 400 for inter series interval; No more than 120 for serial and ring-off device if duration of signal, that's necessary for start of operation of these devices is more than 30	1) At the output of existing outgoing equipment, at the speed 7-13 pulses/s t_{pls}=25 – 106 ms; t_{ps}=37 – 52 ms 2) At the incoming party it is necessry to take into consideration the possibility of pulses arrival before the cancelation of transmission via the 2SC by the incoming party
4. Discon-- nection with simul- arrival of signal SUBSCRIBER IS FREE OR SUBSCRIBER IS BUSY 1 этап	⟼				At incoming party cancelation of transmission via 1SC ≤30 ms	At outgoing party waiting of transmission via 1SC is done during 80-120 ms. In the case of cancelation of transmission via 1SC from outgoing party through ≤30 ms, at incoming party the signals transmittion into the channel is eliminated, outgoing party starts the transmission via the 2SC through 80-120 ms (if lack of transmission via 1SC from incoming party
2 этап			←			
3 этап			⟵		←–	
4 этап		→		←	←⊣	

Table 7.20 (cont.)

Toll connection.

1	2	3	4	5	6	7
5. Subscriber is free or called subscriber ring-off after conversation	→		←	←		1) At incoming party transmission via the 2SC should start after the transmission via the 2SC.
6. Subscriber is busy	→→		←			2) When transit, the outgoing party should not create and increase the time interval between the transmission via 1SC and 2SC
7. Ring	→→	→	←←	←←	At incoming party is no less than 10	3) From the SUBSCRIBER IS BUSY state it is possible to transit into SUBSCRIBER IS FREE or Answer state
8 Reset	→→	→	←←			
9 - Answer	→→		⟵	←		Cancelation of transmission via then 1SC should be ensured no later than via the 2SC
10. Discon-- nection in the- SUBSCRIBER IS FREE state and return into the idle state — 1 stage	⟼		←←	←←	At incoming party is no less than 120-5000	After release of incoming party: 1. Transmission via the 2SC from outgoing party should start not earlier than in 20 ms after the cancelation of transmission via the 1SC from incoming as well as from outgoing party
2 stage		→	⟵	←		
3 stage						
11.Disconnec- tion in the- SUBSCRIBER IS BUSY- state and return to the idle state — 1 stage	⟼		←←		At incoming party is no less than 120-5000	2. Time interval between the cancelation of transmission via the 2SC and transmission is not normalized
2 stage			⟵			
3 stage		→		←		
12. Disconnec- tion in the ANSWER or SEIZURE State and return Into the idle state — 1 stage	⟼					3. Transmission via the 2SC starts from the incoming party after restoration of control circuit, but not earlier than in 20 ms after the cancelation of transmission via the 1SC
2 stage		→		←		

Notes to table 7.20

1. Symbols:

$\rightarrow\rightarrow$ Continuation of the active state of the signalling channel from the previous stage.

$\longrightarrow$ Transition of the signalling channel into the active state.

$\vdash\!\!\!\longrightarrow$ Transition of the signalling channel into the passive state.

2. During the implementation it is nesessary to ensure the priority of the incoming call in the case of conficting calls.

3. Verification of seizure acknowledgment arrival should be perfomed at one of the following stages:

- after the first decadic dial pulse arrival;
- after disconnection;
- after the end of the time out. Outgoing CO should ensure the BUSY tone transmission in the direction of the calling subscriber, or the attempt of the connection establishment via the other trunk.

4. In the case of the two-way use of channel, the waiting of the oncoming seizure should be ensured at the outgoing party after the SEIZURE transmission, and when it's arrival,

should be ensured the reservation or cancelation of outgoing seizure(depends on conductors) and the transmission of BUSY tone to the calling subscriber, or attempt of connection establishment via the other trunk.

5. The given code should be verified by the corresponding algorithm.

Table 7.21 Signalling code of line signals transmission for CO connection with emergency, ordered and information services

Local connection

Stage of connection	CO party		Service party	Notes
	"a" wire	"b" wire		
1	2	3	4	5
1.Idle state: a)with line test b)without line test	 (-) 400-800Ohm (-) 400-800Ohm	 (+) 400-1900Ohm (+) 400-800 Ohm	In the loop: 1 mkF capacitor and 7 kOhm in parallel 1 mkF capacitor	48+/- 4 lines power supply to services is allowed. The resistance of feeding circuits depends on this voltage
2.Seizure and ring	~ 400-1000Ohm 25 Hz	(+) 0-50 Ohm	see p.1.	Ring back tone is send to the subscriber
3.Service answer	~ 400-1000 Ohm 25 Hz	(+) 0-50 Ohm	No more than 600 Ohm loop make	Ring back tone cancellation
4.Transfer into the conversation state	(-) 400-800 Ohm	(+) 400-800 Ohm	Loop through 600 Ohm	
5.ANI request from the service and reception of ANI information	(-) 400-800Ohm	(+) 400-800 Ohm	(+)through 100 Ohm at "a" and "b" wires during the time of ANI req. and recept.	CO should ensure the recog-nition of ANI request signal and it's translation during 20-80 ms
6.Service ring-off first b)without line	(-) 400-800 Ohm	Ï(+) 400-1900Ohm	In the loop: 1 mkF capacitor and in parallel with it 7 kOhm or1 mkF capacitor	Subscriber reseives BUSY tone, and line signal BUSY is sent to the oncoming CO
7.Ring_off a)subscriber ring off first b)service ring_off	(-) 400-800Ohm	(+) 400-800 Ohm	Loop through 600 Ohm	Service receives BUSY tone from CO
	BUSY tone			
	(-) 400-800 Ohm	(+) 400-800 Ohm	In the loop: 1 mkF capacitor and in parallel with it 7 k or1 mkF capacitor	

Notes to table 7.21

1. Seizure to the service is done after 5-7 s. time-out during which the ring-back tone is sent to the subscriber.If during this time-out the noises,that inutate the dialing,will be received than CO devices should be transfered into the state that corresponds to the service ring-off.
2. Depending on the direction towards the service it is possible to have two versions of ANSWER and ANI REQUEST signals transmission towards the outgoing CO(in the backward direction):

2.1. Conversation in the preanswer state ANSWER signal is generated during the request signal arrival and,also,it is generated in every 5-7 min as a 200 ms pulse.

2.2 Conversation in the answer state at the time of the request signal arrival the ANSWER signal is removed.

Table 7.22 Line signals Transmitted in the Woice Frequency Range

Parameter	Signaling system	
	one-frequency	bifrequency
1	2	3
Transmission:		
1. Signalling frequency, Hz	2600□6	1200□5, 1600□5
2. Current level of signalling frequencies, dB0	- 9,5□1	- 9,5□1 for one- and bifrequency signal
3. Difference in the levels of two signalling frequencies, dB, no more than	-	0,8
4. Level of remnants of signalling frequency current, dBm0, no more	-50	- 50
5. Power of signalling currents(of line and control signals) via one channel,mk Ws0, no more than		
- in forward direction	36000	36000
- in back ward direction	36000	48000
Detection:		
1. Validation Conditions		
1.1 Signalling frequency, Hz	2600□15	1200□15, 1600□15
1.2 Absolute level of signalling frequency power, dBm	- 15,0 ... +4,0	- 14,0 ... +3,0
1.3 Level of noise with uniform power level within the 300-3400 Hz frequency band, dBm0	-35,0	-35,0
1.4 Diference of the levels of two signalling frequencies, dB, no more than	-	0
2. Rejestion Conditions		
2.1 Signalling frequency, Hz	2600□15	1200□15, 1600□15
Absolute level of signalling frequency power, dBm	-26.0	-26.0
2.2 Signalling frequency, Hz	2600□100	1200□100, 1600□100
Absolute level of signalling frequency power, dBm	- 15,0 ...+4,0	- 14,0 ... +3,0

Table 7.22 (cont)

1	2	3
3. Distortions inserted receiver with relay, ms, no more than	□4,0	□8,0
4. Connection protection from the line signals imitation by voice ms, no less than	100	100
5. Average number of false starts of operation for 10 hours of conversation no more than	1,0	1,0
6. Speech path break time, ms no more than	50-75	20 before the subscriber answer100-200 after the subscriber answer

Notes to table 7.22

In AMTC-2,3, AMTC-IM, AMTC-5, 6 and in two-frequency semiautomatic equipment the level of one-frequency transmitled signal is (4.3+/-1- Dbm0. The possibility of this level decreasing ahould be considered additionaly.

Table 7.23 Electrical parameters of physical subscriber and trunk lines in local telephone networks

Type of line	Resistance of every of speech wires Ohm, no more than	Resistance of insula tion befween the wires,or bef-ween the any wire and the ground, kOhm, no more then	Operating line capaci ty, mkF, no more than	Attenuation at 1000 Hz , db no more, than	Near-end crosstalk attenuation at 1000 Hz, dB, no less than	Asymmetry attenuation in the 0.3-3.4 Hz frequency band, dB,no less than
1	2	3	4	5	6	7
Subscriber line of:						
- ordinary CO subscriber	600	20	0,5	4,0 (5,0)	69,5	43,0
- remote CO subscriber	1700	20	1,0	4,0 (5,0)	69,5	43,0
- remote switch subscriber	350	80	0,5	4,5	69,5	43,0
Trunk line:						
CO-remote switch	1000	150	1,3	4,5	69,5	43,0
CO- OTT, OTLN	1500	150	1,6	4,5	69,5	43,0
OTLN - ATE	1000	150	1,3	4,5	69,5	43,0
CO - ATE	1500	150	1,6	4,5	69,5	43,0
IMMN - CO	1000	150	1,3	4,5	69,5	43,0
ATE - ITMN	1000	150	1,3	4,5	69,5	43,0
ATE - CO	1000	150	1,3	4,5	69,5	43,0

Notes to table 7.23

1. Subscriber and trunk line limits for several types of step-by-step and crossbar CO,and for CO with stored program control may be differend from those stated in the table.
2. Parameters of universal trunk lines, that are used in RTN should correspond to the toll trunk line parameters.
3. In the case when pole mounted subscriber lines are used in RTN, the resistance of insulation between the wires or between any wire and the ground should be no less than 20 kOhm, as for the pole mounted trunk lines - no less than 50 kOhm Capacity between the wires of subscriber line or between any wire and the ground should be no more than 1 mkF for rural exchanges.
4. The total resistance of subscriber and trunk lines of the remote switch, that has not the feeding circuit (bridge), should not exceed 1000 Ohm.

5. Parameters, that are shown in the Table 7.23 (resistance of the trunk line wires, insulation resistance, operatingcapacity) is the total characteristic of connection between transmitter and receiver of line signals.
6. Total attenuation of the route between remote switch subscriber - CO should not exceed 4.5 dB.
7. Total attenuation of the route CO - ATE and ATE-CO should not exceed 4.0 dB.
8. Resistance of speech wires, the operating capacity of trunks includes the resistance and the capacity of the exchange devices of CO,ATE.
9. The insulation resistance is given taking into account the speech path connectors and wetting resistance in the CO devices. At the parts CO-CO the isolation resistance is decreased to 50 kOhm.
10. If the attenuation of the remote subscriber line exceeds 4.5 dB, than such excess should be compensated by the amplifier in the telset.
11. For cables with 0.32 mm wire's diameter the attenuation of subscriber line at 1000 Hz should be no more than 4.0 dB, and for cables with 0.5,0.64,0.7 mm wires diameter-no more than 5.0 dB.
12. It is not recommended to use physical lines as trunk lines between OTT-ITT, CO-ITT.

Table 7.24 Control signals at the toll network

Signal	ASN-ASN; ASN-ZTTE; ZTTE-QE, EATE	QE,EATE-ASN; QE,EATE-QE, EATE	ATE 5,6-ASN, ATE 5,6 - ATE 5,6	Transmitted combination
1	2	3	4	5
Forward direction Call catrgory (one character) Cc				
1. I priority category automatic call	+	+	-	1
2.I priority category semiautomatic call	+	+	-	2
3.II priority category automatic call	+	+	-	3
4.II priority category semiautomatic call	+	+	-	4
5.III priority category automatic coll	+	+	+	11
6.III priority category semiautomatic coll	+	+	+	12
7.IV priority category automatic coll	+	+	+	13
8.IV priority category semiautomatic coll	+	+	+	14
Connection of echo-suppressors (E-S) (one character) Se-s				
9. Data transmission E-S are not connected	+	+	-	5
10.Telephone message E-S should be connected at outgoing and incoming ends	+	+	-	6
11.Telephone message E-S should be connected at incoming end	+	+	-	7
12.Telephone message E-S should are not to be connected.	+	+	-	8

Table 7.24 (cont.)

1	2	3	4	5
13.Telephone message the satellite shannel is connected	+	+	-	9
Toll or international number of called subacriber or object (up to ten or tuelve characrers) N				
14.Toll number of called subscriber, service CO, services, administration networks, toll exchange and eto	+	+	+	1-10
15.International number of called subscriber or object	+	+	+	1-10
16.End of dialing	+	+	+	11
Backward direction				
1.Request of from the previous exchange	+	+	+	2
After the reception of information from the previous exchange (one character)				
2.Number is received correctly	+	+	+	11
3.Number is received uncorrectly	+	+	+	6

Notes to table 7.24

1 Frequency combinations are given for multifrequency way of transmission.

2. For interaction of ASN, AMTC-2,3, only decadic numbering information is transmitted.
3. ZTTE - zonal terminal toll exchange QE - quasi — electronic E - electronic
4. Signal "Number is received uncorrectly" ("6") is generated only in the case of uncomplete reception of information packet, when digits are received not in the 2 out of 6 code. The single repetition of packet transmission is foressen.

Table 7.25 Control signal that are via OTL

Exchange (node)		Signal
going	incoming	
1	2	3
CO of all types or Step-by-step CO, cross - bar CO with ANI	AMTC -5,6 QE,E ATE	Forward direction 1. Category and zonal number of calling subscriber (combinations from1 to 10) Service characters from ANI combination (#13,#14) 2. Toll or zonal number of called subscriber, toll mini-strative network and etc service, and(decadic code) Backward direction Request of ANI information about the category and called subscriber number (500 Hz + ANI REQUEST line signal)
CO of all typesÏ(with intermediate registers) OTLN Ï(with intermediate) register	AMTC -2,3	Forward direction Toll or zonal number or toll service number, category and number (#1-10) Backward direction 1. Request of information transmis sion (at 700 and 1100 Hz) 2. Lack of trunks (at 700 Hz) 3. Waiting (at 1100 Hz) 4. Release (at 1100 Hz)
QE,E CO QE, E ATE	QE,e OTT	Forward direction 1. Toll or zonal number of calledsubscriber, or number of toll service, administrative network and etc. Category and number of calling. End of dialing (#11) Backward direction 1. Request of information transmission (#2) 2. Number is received correctly (#11) subscriber (#1-10) 2. Number is received incorrectly(#6)

Notes to table 7.25

1. If Frequency RELEASE signal (at 1100 Hz) will be received by intrmediate register after the first stage of information transmission, than it will be considered as an indication to direct the connection to ATE operator and also is considered as a intermediate register release signal.
2. In the cose of the #6 combination arrival (number is received uncorrectly) the signal acket transmision repetition is possible.
3. The Backword transmission of frequency signal for verification of the own number dialing is foreseen. It is recommended to use one-frequency 700 Hz signal, in the other cases it is allowed to use bifrequency 700 and 1100 Hz combination. Transmission and reception conditions should correspond to the requirements statedin 7.34 table. Duration of signal should be no more than 2000 ms.
4. Frequency signal ANI REQUEST (500 Hz) is transmitted in (275□25) ms after the line signal transmission.

Table 7.26 Control signal that are transmitted via toll trunks.

Exchange (node)		Signal	Transmitted combination #
outgoing	incoming		
1	2	3	4
AMTC-5,6 QE, EATE	cross-bar CO QE,E CO ITT of toll switch QE,E ITT of toll switch	Forward direction	
		1.Called subscriber number	1-10
		2.Acknowledgement on the backward signal reception (4,5,8-10)	12
		3.Request of repetition of signal that was received with distorhans	13
		Backward direction	
		1. Signal of the first digit transmission or of the start of the digit information transmission from the first character	1
		2. Next digit transmission	2
		3. Repetition of earlier transmitted digit	3
		4. End of the connection establishment	4
		5. Subscriber is busy	5
		6. Repetition of the information that was received with distortions	6
		7. Lack of free routes	7
		8. Decadic transmission of the called subscri-ber number, beginning from the first digit without the connection establishment interruption	8
		9. Decadic transmission of the next and than the last digits of the called subscriber number	9
		10.Repetition of the earlier transmitted and then the last digits of the called subscriber number (decadic code)	10
		11.Lack of the frequency information reception	15
AMTC-5,6 QE,E ATE	step-by-step CO step-by-step toll ITT	Forward direction	
		Called subscriber number(decadic code)	
		Backward direction	
AMTC-2,3	CO of all types	Absence of signal	

Notes to table 7.26

1. The call category signal is recommended to be transmitted additional from QE,E ATE to QE,E ATE after the called subscriber nember (automatic call - #4, semiautomatic call - #15)
2. Signal under the number "11" (#15) is used for connection of QE, E ATE with cross-bar CO (ATCK-Y), and with QE,E CO.
3. End of the connection establishment signal (# 4) is transmitted when the connection to the called subscriber is possible. SUBSCRIBER IS BUSY signal (#5) is transmitted if the called subscriber is unavailable.

Table 7.27 Control signal at the toll network

Signal	Urban network		Rural network		Transmitted combination #
	cross-bar CO -cross-bar CO; cross-barCO-QE, E CO	step-by -stepCO -step-by-step-cross-bar CO	cross-bar, step-by-step CO - cross-bar, step-by-step CO; cross-bar, step-by-step CO-cross-bar CO	QE CO--QE CO	
1	2	3	4	5	6
Forward direction					
1.Called subscriber number	+	-	-	+	1-10
2.Calling subscriber number (decadic code)	-	_	_	-	-
3.Acknowledgement on the backward signal reception (4,5,8-10)	+	-	-	+	12
4.Request on the repetition of signal that was received with distortion	+	-	-	+	13
Backward direction					
1.First digit transmission or biginning of the numbering information transmission from the first digit	+	-	-	+	1
2. Next digit transmission	+	-	-	+	2
3.Repetition of the earlier transmitted digit	+	-	-	+	3
4. End of the connection establishment	+	-	-	+	4

Table 7.27 (cont.)

1	2	3	4	5	6
5.Subscriber is busy	+	-	-	+	5
6.Repetition of information that have been received with distortion	+	-	-	+	6
7.Lack of free routes	+	-	-	+	7
8.Decadic transmission of the called subscriber number beginning from the first digit without the interruption of the connection establishment	+	-	-	+	8
9.Decadic transmission of the next and then the following digits of the called subscriber number	+	-	-	+	9
10.Repetition of the earlier transmitted and then the following digits of the called subscriber number (decadic code)	+	-	-	+	10
11.Lack of the frequency information reception.	+	-		+	7

Notes to table 7.27

1. Lack of the frequency information reception signal (#15) is used for connection between the cross-bar CO (ATCK-Y) and cross-bar CO (ATCK-Y),QE,E CO.

Table 7.28 Code "2" out of "6"

Combination number	Frequency combination	Combination number	Frequency combination
1	$f_0\ f_1$	9	$f_2\ f_7$
2	$f_0\ f_2$	10	$f_4\ f_7$
3	$f_1\ f_2$	11	$f_0\ f_{11}$
4	$f_0\ f_4$	12	$f_1\ f_{11}$
5	$f_1\ f_4$	13	$f_2\ f_{11}$
6	$f_2\ f_4$	14	$f_4\ f_{11}$
7	$f_0\ f_7$	15	$f_7\ f_{11}$
8	$f_1\ f_7$		

Notes to table 7.28

Digits 1-0 correspond to the multifrequency combinations 1-10.

Table 7.29 Ways of control signals transmission via toll network

Exchange (node)		Way of transmission
Otgoing	Incoming	
ASN,AMTC-7-10	ASN,AMTC-7-10	CCS, pulse packet
ASN,AMTC-7-10	AMTC-5,6	Pulse packet
AMTC-5,6	AMTC-5,10;ASN	the same
ASN,AMTC-5-10	AMTC-2,3	Decadic code
AMTC-IM,2,3	Any type	the same

Table 7.30 Ways of control signals transmission via OTL

Type of CO, OTT, OTLN	Type of AMTC	Way of transmission	
		Called subscriber number	category and number of calling subscriber
QE,E	QE,E	CCS, pulse packet	CCS, pulse packet
QE,E,S-S(with IR), C-B(with IR)	AMTC- 2,3	Pulse packet	Pulse packet
S-S with ANI Ï(without IR), C-B with ANI (without IR),	AMTC-5,6 QE, E	Decadic code	Gapless packet
S-S without ANI (without IR), C-B with ANI (without IR),	AMTC-1M,5,6, QE, E	Decadic code	Decadic code (only number)
QE,E	AMTC-5,6	Decadic code	Gapless packet

Nite: IR - intermediate register.

Table 7.31 Ways of control signals transmission via toll trunks.

ATE type	Type of toll ITT(CO,SSN)	CO Type	Part of network	Way of transmission
1	2	3	4	5
QE, E	QE, E	QE, E	ATE-TITT-CO	CCS, pulse shuttle
QE, E	QE, E	CB	ATE-TITT TITT-CO	CCS,pulse shuttle pulse shuttle
QE, E	QE, E	S-S	ATE-TITT TITT-CO	CCS,pulse shuttle. Decadic code
QE, E,5,6	CB	CB,QE,E	ATE-TITT-CO	Pulse shuttle
QE, E,5,6	CB	S-S	ATE-TITT-CO	First digits for TITT - pulse shuttle,the next digit for CO - decadic code
QE, E,5,6	S-S	Any	ATE-TITT-CO	Decadic code
5,6	QE, E	QE,E	ATE-TITT TITT-CO	Pulse shuttle CCS, pulse shuttle
5,6	QE	S-S	ATE-TITT-CO	First digits for TITT - pulse shuttle,the next digit for CO - decadic code
5,6	QE, Ц	лЗ	ATE-TITT-CO	кulse shuttle
2,3,1M,s/a	S-S	Any	ATE-TITT-CO	Decadic code
2,3,1M,s/a	CB, QE, E	S-S	ATE-TITT-CO	Decadic code
2,3,1M,s/a	CB	CB, QE, E	ATE-TITT TITT-CO	Decadic code pulse packet
2,3,1M,s/a	QE,E	QE,E	ATE-TITT TITT-CO	Decadic code CCS, pulse shuttle
2,3,1M,s/a	QE,E	CB	ATE-TITT TITT-CO	Decadic code Pulse shuttle

Note table 7.31

TITT - toll ITT.

2, 3, 5, 6, 1M - types of ATE (AMTC-2, 3, 5, 6, 1M)

Table 7.32 Ways of control signals transmission via trunks in UTN.

Type of outgoing CO	Type of OTT	Type of ITT	Type of incoming CO	Part of network	Way of transmission
1	2	3	4	5	6
QE, E	QE, E	QE, E	QE, E	CO-OTT-ITT-CO	CCS, pulse shuttle
QE, E	QE, E	QE, E	CB	CO-OTT-ITT ITT-CO	CCS, pulse shuttle pulse shuttle
QE, E	QE, E	C-B	QE, E, CB	CO-OTT OTT-ITT-CO	CCS,pulse shuttle pulse shuttle
QE, E	CB	QE,E,C-B	CB	CO-OTT-ITT- CO	Pulse shuttle
QE, E	CB	QE, E	QE, E	CO-OTT-ITT ITT-CO	Pulse shuttle CCS,pulse shuttle
QE, E	QE, E	S-S	Any	CO-OTT OTT-ITT-CO	CCS, pulse shuttle Decadic code
QE, E, CB	S-S	Any	S-S	ITT-CO CO-OTT-ITT-CO	CCS, pulse shuttle Decadic code
CB	QE,E,CB	CB	QE,E,CB	CO-OTT-ITT-CO	Pulse shuttle
CB	S-S	QE,E	QE,E	CO-OTT-ITT ITT-CO	Decadic code CCS, pulse shuttle
S-S	QE,E	QE,E	QE,E	CO-OTT OTT-ITT-CO	Decadic code CCS, pulse shuttle
S-S	QE,E	QE,E	CB	CO-OTT OTT-ITT	Decadic code CCS, pulse shuttle pulse shuttle
S-S	QE,E,CB	CB	QE,E,CB	CO-OTT OTT-ITT-CO	Decadic code Pulse shuttle
S-S	CB	QE,E	CB	CO-OTT OTT-ITT-CO	Decadic code Pulse shuttle
S-S	QE,E	QE,E	S-S	CO-OTT OTT-ITT ITT-CO	Decadic code CCS, pulse shuttle Decadic code
S-S	QE,E,CB	CB	S-S	CO-OTT OTT-ITT ITT-CO	Decadic code CCS, pulse shuttle Decadic code
S-S	Any	S-S	Any	CO-OTT-ITT-CO	Decadic code
S-S	CB	QE,E	QE,E	CO-OTT OTT-ITT ITT-CO	Decadic code Pulse shuttle CCS, pulse shuttle

Table 7.32 (cont.)

1	2	3	4	5	6
S-S	CB	QE, E,CB	S-S	CO-OTT OTT-ITT ITT-CO	Decadic code Pulse shuttle CCS, pulse shuttle
Any	S-S	CB	QE, E, CB	CO-OTT-ITT ITT-CO	Decadic code Pulse shuttle

Note: Control signals transmission between the remote switches and nost exchanges of quasi-electronic systems is done via common control channel; between crossbar remote switch ЦСК-100 and CO's of crossbar and step-by-step types — using decadic method.

Table 7.33 Ways of control signals transmission via trunks on RTN

Terminal office (TO)	Transit exchange(TE)	Control office(CO)	Part of network	Way of transmission
ИАТСКЭ	ИАТСКЭ	ИАТСКЭ	TO-TE-CO and TO-CO	Common control channel, CCS
ИАТСКЭ	ИАТСКЭ	СВСО	TE-CO	Pulse shuttle
ИАТСКЭ	ИАТСКЭ	S-S CO, АТСК-100/200	TE-CO	Decadic code
QE TO	QE TE	QE CO	TO-TE-CO	Pulse shuttle
QE TO	QE TO	CB CO	TO-TE-CO	Pulse shuttle
QE TO	QE TO	S-S CO, АТСК-100/200	TE-CO TE-CO	Pulse shuttle Decadic code
QE TO	АТСК-50/200 100/200	Any type	TO-TE-CO	Decadic code
АТСК-50/200 100/200	QE TE	QE CO	TO-TE TE-CO	Decadic code Pulse shuttle
АТСК-50/200 100/200 АТСК-100/500	QE TE	CB CO	TO-TE TE-CO	Decadic code Pulse shuttle

Note: ИАТСКЭ type of QE exchange (russian abbreviation).
АТСК-100/200, 50/200 - type of crossbar exchanges (russian abbreviation).

Table 7.34 Reception and transmission conditions of control signals transmitted in the voice frequency band.

Parameter	Conditions	
	via toll channels	via OTL, TL, TTL
1	2	3
1. Multifrequency code		
Transmission:		
1. Signalling frequency, Hz	700, 900, 1100, 1300, 1500, 1700	700, 900, 1100, 1300, 1500, 1700
2. Register signalling code	"2 out of 6"	"2 out of 6"
3. Rate of nonlinear distortions. (%), no more than	5,0	5,0
4. Level of every signalling frequency, dBmO	-7,3 ± 0,8 (*)	-7,3 ± 0,8 (*)
5. Signalling frequency, deviation from nominal value,%	±0,25	± 0,5
6. Difference in the time of arrival and removal of one signalling frequency ralative to one another,(ms) no more than	1,0	1,0
7. Residual currents level of every signaling frequency, dBmO , no more than		
- if the absence of multifrequency signal	- 50,0	- 50,0
- during multifrequency signal transmission	- 30,0	- 30,0
Reception:		
1. Multifrequency receiver operation		
1.1 Deviation of every signal ling frequency relative to it's nominal value, Hz	± 15	± 15

Table 7.34 (cont)

1	2	3
1.2 Absolute power level of multifrequency signal, dB:		
- multiplexed lines	- 17,0 ± 1,0	-17, 0±3,0
- unmultiplexed lines at the frequency :		
700 Hz		-6,5_-27,4**
900 Hz		-6.5...-29.0
1100 Hz		-6.5...-31.0
1300 Hz		-6.5...-32.6
1500 Hz		-6.5...-34.3
7100 Hz		-6.5...-36.0
1.3 Difference in the levels of two signalling frequensies, dB, no more than	5.0 (***)	3.0 (***)
700 and 1700 Hz	-	1700 Hz frequency level is lower than 700 Hz frequency level at no more than10.4 dB
Close by standing (700 and700 and 1700 Hz900 Hz, 900 and 1100 Hz and etc)	-	Level opf the higher frequency is no more than 4.3 dB higher, or 2.6 dB lower than the level of the low frequency
700 and 1300 Hz	-	1700 Hz frequency level is lower than 1300 Hz frequency level by no more than3.5 dB.
1.4 Absolute level of the third interference frequency in the 300-3400 Hz band		15 dB lower than the minimum level of one of the signal frequencies
1.5 Absolute interference level at 3800-or 3825 Hz , dBm	-	- 17.4
1.6 Maximum distortions of group time of propagation, ms, no more than	7.5	3.0

Table 7.34 (cont)

1	2	3
4. Level of noise with uniform energy spectrum, in the 300-3400 Hz band, dBmO	-35,0	-35,0
2. Lack multifrequency receiver operation		
2.1 Signalling frequency, deviation , Hz	±100	±100
Absolute power level of every signaling frequency	p.2 of operation conditions	p.2 of operation conditions
2.2 Signalling frequency, deviation , Hz	±15	±15
Absolute power level of every signaling frequency	13 dB below the minimum level	13 dB below the minimum level
3. Return loss of receiver input impedance, dB, no less than	20	20
4. Receiver plus relay distortions, ms	± 10	-
2. ANI request 500 Hz		
Transmission:		
1. Signalling frequency, Hz	-	500
2. Rate of nonlinear distortions, % no more than	5,0	5
3. Signalling frequency level dBmO	-	-4,5 ± 0,5
4. Signalling frequency, deviation from nominal value, %	-	0,5
5. Duration of signal, ms	-	100 ± 10
Reception:		
1. Receiver operation		
1.1 Absolute power level of signal, dB	-	-4,0±32,0
2. Lack of receiver operation	-	
2.1 Signalling frequency, deviation , Hz (if -4...-32.0 dB levels of signal)	-	± 25 and more
2.2 Signal power level, dB	-	-38,0 and less
3. Signal's detection time, ms	-	70 ± 10

(*) Level of bifrequency signal is 3dB higher than the level of every signalling frequency.

(**) For equipment of crossbar CO, that have been produced untill 1980 the absolut levels of signalling frequencies at the receiver's input should be:

700 Hz -7.4 ... -26.4
900 Hz -7.4 ... -28.2
1100 Hz -7.4 ... -30.0
1300 Hz -7.4 ... -31.6
1500 Hz -7.4 ... -33.5
1700 Hz -7.4 ... -35.2

(***) For toll channels and multiplexed OTL, TTL the mentioned levels diference is allowed between any frequencies.

Notes to table 7.34

1. For the remote switches the signals propagation through the district CO the established levels of transmission and reception should correspond to the 7.34 table.
2. Additional parameters of multifrequency receivers of electronic and quasielectronic exchanges.

2.1 Operation receiver reliably validates signalling frequencies under the following conditios:

- difference of levels of two adjacent frequencies in the bifrequency signal (700 and 900, 900 and 1100 Hz and ete) is within 6 dB limits;
- difference of levels of 700 and 1100, 900 and 1300, 1100 and 1500, 1300 and 1700 Hz frequencies is within 7 dB limits;
- difference of levels of 700 and 1300, 900 and 1500, 1100 and 1700 Hz frequencies is within 8 dB limits;
- difference of levels of 700 and 1500, 900 and 1700 Hz frequencies is within 10 dB limits;

2.2 Receiver should not react on the interferences with diration less than 16 ms

2.3 Receiver should not detect signals if deviations of signalling frequencies from the nominal value are more than 65 Hz.

Table 7.35 Control lime outs for operation via trunks and lines

Controled stages	Duration of time-out	Action after the end of the time out
1	2	3
1.From OTL seizure to the subscriber category and number reception, if the ANI is used (on three requests)	6-8s for QE,E ATE 9-11s for AMTC-5,6	BUSY tone to the CO party. Line signal "BUSY" is possible. Failure registration
2.From OTL seizure up to the ATE dial tone reception (for CO equipped by the tonal signal receivers)	15-20s	BUSY tone to calling subscriber, DISCONNECTION to ATE party. Failure registration
3.From the moment of ANI request transmission start up to the begin ning of multifrequency information reception	no less than 600 ms	Line signal REQUEST REMOVAL transmission, transition into the pre-answer state. Repetition of ANI REQUEST in 0.6-1.2 (up to three times)
4.From ATE dial tone transmis-sion up to the detection of the first digit in the decadic code or between the two digits detection	10-20s	BUSY tone transmission to the outgoing CO. BUSY line signal is possible. Failure registration.
5.From the transmission of the last digit of the number up to the called party condition signal reception(or answer signal if no sucn signal transmitted)	a) at OTL of intrazonal networks is 20-30s b) at toll network is 2-4min c)at the channels of intra-zonal networks is 2-4 min d) in local networks is 8-20 min	Control: a),c) at ATE; b) at ATE,ASN,ZTN; d) at outgoing CO. DISCONNECTION signal transmissi-on to the incoming exchange, BUSY TONE, BUSY line signal transmission to the calling subscriber. Failure registration
6.From the SUBSVRIBER IS FREE signal reception up to the answer	1-2 min (outgoing ATE) 2-4 min (ASN)	Control at outgoing ATE. DISCONNECTION signal transmis-sion to the incoming exchange, BUSY line signal is possible
7.When semiautomatic commu-nication-from the called subscri-ber ring-off up to the disconnec-tion or repeated answer(from the BUSY line signal reception up to the disconnection or answer)	2-4 min	Control at the outgoing ATE(ASN). DISCONNECTION signal is trans-mitted to the incoming exchange, and acoustic and optical BUSY tone is transmitted to the switchboard party

Table 7.35 (cont)

1	2	3
8.From the DISCONNECTION signal transmission up to the reception of the RELEASE-GUARD signal or up to the transition to the idle state	a) at the parts of toll and intrazonal networks is 20-40s b)at local network is 0.3-30 min	DISCONNECTION signal end- ing. Repeated transmission of the DIS-CONNECTION signal every 5min with 1s duration Block of channel or line. Failure registration.
9.From the BUSY,RING-OFF line signal transmission up to the DISCONNECTION signal detection or called subscriber answer in case of semiautomatic communication	2-4 min	Control at the incoming party (ATE, ASN). Disconnection to the calling subscriber. Transmission of the BUSY tone to the outgoing exchange
10.From the BUSY,RING-OFF line signal transmission up to the DISCONNECTION signal reception in case of semiautomatic communication	10-20 s	Control at the incoming party (ATE, ASN). Disconnection of outgoing connection to the called subscriber. Waiting of disconnection from the outgoing exchange. Failure registration
11.Information transmission by "pulse packet" method		
11.1.From the seizure signal transmission up to the request detection (# 2 combination) From the "end of dialing" signal transmission (#11 combination) up to the backward signal reception (#11, #6 combinations)	At the toll and intrazonal networks is10-20s	Control at the incoming party (ATE, ASN). Disconnection of connection to the called subscriber. Another link selection, repetition of the call set up attempt. Failure registration
11.2.From the request of the transmission up to the information packet reception (# 2 combination)	5-10 s	Control at the incoming party (ATE, ASN). # 6 combination transmission (packet was received with failures). Waiting of the packet reception Failure registration.

Table 7.35 (cont)

1	2	3
12. Signals transmission by "pulse shuttle" method. 12.1 From the digit transmission up to the acknowledgement combination reception. 12.2 From the request trans-mission up to the digit detection	 At TTL is 10-20 s At TL is 200-400 s At TTL is 10-20 s At TL is 200-400 s	Control at the outgoing exchange. Disconnection of the first connection. Reselection of outgoing trunk or line and transmission of information. Failure registration. Control at the incoming exchange. BUSY tone, and BUSY line signal transmission. Failure registration
13.Limitation of charge able conversation period	a)At ATE is 10-20 min with the possibility of 10 min interval establishm. b)for local payphones is 3 min	Storage of chargeable period, disconnection
14.In the bifrequency signalling channels-from the SEIZURE line signal transmission till the ready to number dialing" signal reception from the first code digit transmission up to the "ready to number dialing" signal reception	20-40 s	Storage of damage, disconnection. For the QE, E ATE - reselection of the outgoing trunk
15.Period of unchargeable conversation	12-20 s, with 6 s intervals establishment possibility	Conversation should not be charged, it should be stored in the mode of "statistical day"

Table 7.36 Composition of signal, transmitted via CCS

Signal	Via the urban network shannels	Via the intrazonal and local network lines			Signal when the other mode of transmission
		OTL	TTL	TL	
1	2	3	4	5	6
1. Forward direction address signals					
Call category	+	+	+	+	The same
Nature of address	+	+	+	+	-
Nature of circuit (for example satellite)	+	-	-	-	The same
Continuity-check control	+	+	+	+	-
Outgoing echo supressor indicator	+	+	+	+	The same
Address signals(called subscriber directory number)	+	+	+	+	The same
End of pulsing	+	+	+	+	-
2. Forward call set-up signals					
Calling line identifity	-	-	-	+	The same
Calling party category and identifity	-	+	-	+	-
Calling party national number	+	+	+	-	The same
Calling party international number	+	+	+	-	-
Calling-line-identifity unavailable indicator	+	+	+	+	-
Continuity signal	+	+	+	+	-
Continuity failure signal	+	+	+	+	-

Table 7.36 (cont)

1	2	3	4	5	6
3. Backward information request signals					
Calling line identify and category request	+	+	+	+	The same
Incoming echo supressor indicator	+	+	+	+	-
4. Backward call set-up signals (successful)					
Address complete signal	+	+	+	+	At local network signal is sent after the connection is provided; at toll network it indicates correct number reception
Address complete signal, charge	-	-	-	+	
Address complete signal, no charge	-	-	-	+	
Address complete signal, payphone	-	-	-	+	-
Subscriber free indicator	+	-	+	-	The same
5. Backward call set-up signals (unsuccessful)					
Switching equipment congestion signal	+	+	+	+	At local network congestion signal or BUSY signal (tone) At toll network BUSY signal
Circuit group congestion signal	-	-	-	+	
National network congestion signal	+	-	-	-	At local network - DISCONNECTION or SUB_SCRIBER IS BUSY signal (BUSY tone). At toll network-BUSY signal
Subscriber busy signal	+	+	+	+	
Send-special-information-tone signal	-	-	-	+	

Table 7.36 (cont)

1	2	3	4	5	6
Address-incomplete signal received	+	-	-	+	At local network - DISCONNECTION OR SUB_ SCRIBER IS BUSY signal (BUSY tone). At toll network-NUMBER WAS RECEIVED INCORRECTLY
6. Call supervision signals					
Answer signal, charge	+	+	+	+	Answer
Answer signal, no charge	-	-	-	+	-
Clear-back signal	+	+	+	+	The same
Calling party clear signal	-	-	-	+	The same
Disconnection (clear forward) signal	+	+	+	+	The same
Reanswer signal	+	-	+	-	The same
Recall	+	-	+	-	The same
Transition into the preanswer state (ANI request removal	-	+	-	+	The same
7. Signals of the channel or trunk state					
Release-guard	+	+	+	+	The same
Blocking	+	+	+	+	The same
Blocking acknowledgement	+	+	+	+	The same
Unblocking	+	+	+	+	The same
Unblocking acknowledgement	+	+	+	+	-
Continuity check request	+	+	+	+	-
Reset circuit signal	+	+	+	+	-

Table 7.36 (cont)

1	2	3	4	5	6
8. Circuit group supervision messages					
Maintenance oriented group blocking	+	+	+	+	The same
Maintenance oriented group blocking	+	+	+	+	-
Unblocking	+	+	+	+	-
Unblocking acknow ledgement	+	+	+	+	-
Hardware failure oriented group blocking	+	+	+	+	-
Hardware failure oriented gro-up blocking acknowledgement	+	+	+	+	-
Hardware failure oriented group unblocking	+	+	+	+	-
Hardware failure oriented group unblocking acknowledgement	+	+	+	+	-
Trunk group capacity ajustment	+	+	+	+	-
Trunk group capacity ajustment acknowledgement	+	+	+	+	-
Software generated group blocking	+	+	+	+	-
Software generated group bloc	+	+	+	+	-
king acknowledgement	+	+	+	+	-
Software generated group unblocking	+	+	+	+	-
Software generated group unblocking acknowledgement	+	+	+	+	-

Table 7.36 (cont.)

1	2	3	4	5	6
9. Additional signals used between the telephone exchanges					
Break-in possibility	-	-	-	+	-
Called party free	-	-	-	+	-
Answer	-	-	-	+	-
Closed user group call indicator request	-	-	-	+	-
Closed user group indicator and selection request	-	-	-	+	-
Closed user group indicator and selection	-	-	-	+	-
Trunk identification	-	-	-	+	-

Table 7.37 Signalling Network Management. Signals

Changeover
Changeover acknowledgement
Changeback
Changeback acknowledgement
Emergency changeover
Emergency changeover acknowledgement
Transfer prohibited
Transfer allowed acknowledgement
Signalling route set-test
Signalling route set-up
Signalling route set-up
Signalling route set-up
Transfer - prohibited acknowledgement
Transfer - allowed

Table 7.38 Composition and codes of the signalling section state signals

Signal	Code
Status indication "Alignment failure"	000
Status indication "Normal Alignment"	001
Status indication "Processor Outage"	100
Status indication "Emergency Alignment"	010
Status indication "Out of service "	011

Table 7.39 Indicator codes of the type of message of the signalling unit service part.

Signal	Code
Signalling messages of the telephone network	0100
Control messages of the signalling network	0000
Signalling link state	0110
Measurement and signalling network maintenance messages	0111
Messages of the telephone network	0001
Technical operation system	1100
Spare for international use	0010
	0011
	0101
Spare for national use	1101
	1110
	111

Table 7.40 Codes of auxilary field indicators of the signalling unit service part.

Indicator	Code
International message	00
Spare (only for international communication)	01
National message of the toll network	10
National message of zonal or local networks	11

Table 7.41 Telephone Signal Message Heading Codes.

Indicator	Code
Spare for national use	0000
Forward address message	0001
Forward set-up message	0010
Backward set-up request message	0011
Successful backward set-up information message	0100
Unsuccessful backward set-up information	0101
Call supervision message	0110
Circuit supervision message	0111
Circuit group supervision message	1000
Additional messages between the telephone exchanges	1001
Spare for international and national use	1010
	1011
Spare for national use	1100
	1111

Table 7.42 Codes of the telephone network control signals.
(forward direction).

Signal	Code
a) Heading code	
Initial message	0001
Initial message with additional information	0010
Subsequent message	0011
Subsequent message with one signal	0100
b) Call category indicator	Bits FEDCBA:
Spare for international network	000000
	001000
I category automatic call	001111
I category semiautomatic call	001110
II category automatic call	010001
II category semiautomatic call	010000
III category automatic call	010011
III category semiautomatic call	010010
IV category automatic call (unpriority)	001010
IV category semiautomatic call (unpriority)	001001
Data transmission	001100
Test call	001101
Spare	010100
	111111
c) Message indicators	
Address type indicator	Bits BA
Local subscriber number	00
Spare for national network	01
Toll (national) number of subscriber or object	10
International number	11
Nature-of-circuit indicator	CD bits::
No satellite circuit in the connection	00
One satellite circuit in the connection	01
Spare	10
Spare	11
Countinuity-check indicator	Bits FE:
Continuity-check not required	00
Continuity-check required on this circuit	01
Continuity-check performed on previous circuit	10
Spare	11
Echo-suppressor indicator	Bit G:
Outgoing half echo suppressor not included	0
Outgoing half echo suppressor included	1
Incoming call indicator	Bit H:
National call	0
International call	1
Redireced call indicator	Bit I:
Not a redirected call	0
Redirected call	1

Table 7.42 (cont.)

Signal	Code
All-digital-path-required indicator	Bit J:
Ordinary call	0
Digital path required	1
Signalling path indicator	Бит K:
Any path	0
All signalling system N7 path	1
Spare	Бит L:
d) Address signals	
"0" digit	0000
"1" digit	0001
"2" digit	0010
"3" digit	0011
"4" digit	0100
"5" digit	0101
"6" digit	0110
"7" digit	0111
"8" digit	1000
"9" digit	1001
Spare	1010
11 code	1011
12 code i	1100
Spare	1101
Spare	1110
End-of-pulsing	1111
e) First indicator octet	
Network capability of user facility information indicator	Bit A:
Not included	0
Included	1
Closed user group information indicator	Bit B:
Not included	0
Included	1
Additional calling party information indicator	Bit C
Not included	0
Included	1
Additional routing information indicator	Bit D
Not included	0
Included	1
Calling line identify indicator	Bit E
Not included	0
Included	1
Original called adress indicator	Bit F
Not included	0
Included	1
Charging information indicator	Bit G
Not included	0
Included	1

Table 7.42 (cont.)

Signal	Code
Spare, reserved for indication of absence or presence of the second indicator octet	Bit H
Information about the services, provided to user Indicator of connection to the busy subscriber	Bit A
Connection to the busy subscriber	1
Indicator of identification of subscriber line	Bit B
Lack of called subscriber line identification	0
Subscriber line identification included	1
Spare	Bits C-H
g) Closed user group information	
Closed user group call indicator	Bits BA
Orfinary call	00
Check	01
Outgoing access allowed	10
Outgoing access not allowed	11
Spare	Bits DC
h) Calling party line identification	
Address indicators	Bits DCBA
Address type indicator	Bits BA
Local (zonal) number	00
Catergory and number of local network subscriber	01
National number	10
International number	11
Calling party identity presentation indicator	Bit C
All types of number presentation (local, national international) available	0
Limited of number of types available	1
Incomplete calling line identity indicator	Bit D
No indication	0
Incomplete calling line identity	1

Table 7.43. Forward Set-up Information Message

Signal	Code
a) Forward set-up information	0001
Responce type indicators	Bits HGFEDCBA
Calling party category indicators	Bit A :
Not included	0
Included	1
Calling line identity indicator	Bit B
Not included	0
Included	1
Original called address indicator	Bit D:
Not included	0
Included	1
Echo suppressors connection indicator	Bit E:
Outgoing and incoming half echo suppressor to be connected	0
Outgoing half echo suppressor to be connected	1
Malicious call identification indicator	Bit F:
Not provided	0
Provided	1
Hold indicator	Bit G
Not provided	0
Provided	1
Index indicator	Bit H
Not provided	0
Provided	1
a) Continuity signal	0011
b) Continuity-failure signal	0100

Table 7.44 Backward Set-up Request Message.

Signal	Code
General Request Message	0001
a) Request type indicators	HGFEDCBA bits:
Calling party category indicator	A bit:
Calling party category request	0
Calling party category request	1
Calling line identity request indicator	B bit:
No calling line identity request	0
Calling line identity request	1
Indicator of incoming and transit exchange identity	C bit:
Indentity of exchange is transmitted	0
Indentity of exchange is not transmitted	1
Original called address indicator	D bit:
Original called address not included	0
Original called address included	1
echo-suppressor indicator	E bit:
No information (echo-suppressors is not connected)	0
Information about the echo-suppressors connection is transmitted	1
Malicious call tracing indicator	F bit:
Malicious call tracing not provided	0
Malicious call tracing provided	1
Hold indicator	G bit:
Hold not provided	0
Holding provided	1
Index indicator	H bit:
Index not provided	0
Index provided	1
b) Call category	FEDCBA bits:
Source is unknown (lack of calling subscriber category indicator	000000
Call category code	up to 111111

Table 7.45 Successful Backward Set-up Information Messages.

Signal	Code
Adress-complete message	0001
Message indicators	HGFEDCBA bits:
Type of adress-complete signal indicators	BA bits:
Adress-complete signal	00
Adress-complete signal, charge	01
Adress-complete signal, no charge	10
Adress-complete signal	11
Subscriber-free indicator	C bit:
No indication	0
Subscriber - free	1
Incoming echo suppressor indicator	D bit:
No incoming half echo-suppressor included	0
Incoming half echo-suppressor included	1
Call forwarding indicator	E bit:
Call not forwarded	0
Call forwarded	1
Signalling path indicator	F bit:
Any path	0
All CCS N*2 path	1
Spare for national use	HG bit:
Charging signal	0010
Subscriber - free signal	0011

Table 7.46 Unsuccessful Bacward Set-up Information Messag

Signal	Code
Spare	0000
Switching - equipment - conjestion	0001
Circuit - group - conjestion	0010
National - network - conjestion	0011
Address incomplete	0100
Call - failure	0101
Subscriber - busy	0110
Unallocated number	0111
Zine - out - of - service	1000
Send - special - information - tone	1001
Number - is - changed	1010
Digital path not provided	1011
Access barred	1100
Spare	1101
Information expansion	1110 to 1111

Table 7.47 Cull Supervision Message.

Signal	Code
Spare	0000
Answer signal, charge	0001
Answer signal, no charge	0010
Clear-back signal	0011
Calling party	1010
Clear signal	0100
Clear - forward - signal	0101
Re-answer	0110
Intrusion (call to operator)	0111
Ring - request	1000
Ring - request - removal	1001
Transition into the preanswer state (ANI request removal)	1011 to 1110
Spare	1110
Information expansion	1111

Table 7.48 Circuit Supervision Signals.

Signa	Code
Spare	0000
Release - guard signal	0001
Blocking signal	0010
Blocking acknowledgement signal	0011
Unblocking signal	0100
Unblocking - acknowledyement signal	0101
Continuity check request signal	0110
Reset-circuit signal	0111
Spare	1000 to 1111

Table 7.49 Blocking Supervision Messages.

Signal	Code
Spare	0000
Maintenance oriented group blocking	0001
Maintenance oriented group blocking acknowledgement	0010
Maintenance oriented group unblocking	0011
Maintenance oriented group unblocking acknowledgement	0100
Hardware failure oriented group blocking	0101
Hardware failure oriented group blocking acknowledgement	0110
Hardware failure oriented group unblocking	0111
Hardware failure oriented group unblocking acknowledgement	1000
Circuit group reset	1001
Circuit group reset acknowledgement	1010
Software generated group blocking	1011
Software generated group blocking acknowledgement	1100
Software generated group unblocking	1101
Software generated group unblocking acknowledgement	1110
Spare	1111

Table 7.50 Additional Messages Used Between Telephone exchanges (forward and backward direction).

Signal	Code
Break - in Permission	0001
Called - party - free	0010
Answer	0011
Validation request and closed user group selection	0100
Closed user group validation request	0110
Circuit identification signal	0111
Резерв	1000 1111

Table 7.51 Network Management Messages Headings

Signal	Code
Spare	0000
Changeover and changeback messages	0001
Emergency changeover messages	0010
Spare (for messages of signalling network traffic control)	0011
Transfer - allowed and transfer - prohibited messages	0100
Signalling-route-set-test message	0101
Spare	0110
	0111
Signalling-data-link-connection-oder message	1000

Table 7.52 Changeover and Changeback Signals.

Signal	Code
Changeover order signal	0001
Changeover acknowledgement signal	0010
Changeback declaration signal	0101
Changeback acknowledgement signal	0110

Table 7.53 Emergency Changeover Signals.

Signal	Code
Emergency changeover signal	0001
Emergency changeover acknowledgement signal	0010

Table 7.54 Transfer-allowed and Transfer-prohibited Signals

Signal	Code
Transfer-prohibited signal	0001
Transfer-prohibited acknowledgement	0010
Transfer-allowed signal	0101
Transfer-allowed acknowledgement	0110

Table 7.55 Signalling-rout-set-test signals.

Signal	Code
Signalling-route set-test	0001

Table 7.56 Signalling-data-link-connection-order signals

Signal	Code
Signalling-data-link-connection-order	0001
Connection-successful	0010
Connection-not-successful	0011
Connection-not-possible	0100

8. THE TECHNICAL MAINTENANCE SYSTEM.

8.1. The technical maintenance of the telephone network is a part of a technical operation.

8.1.1. The telephone network technical operation is a complex of technical and organizational measures to support and restore the efficiency of the telephone network equipment in conditions, when the subscribers maintenance is provided with desirable quality for transmission by them of any kind of information this network supports.

The telephone network technical operation includes: the technical maintenance, network equipment repaire, network control and the range of other measures.

8.1.2. The telephone network technical maintenance is a complex of works intended to provide a functioning of this network and to support its efficiency or its good conditon and it includes: switching equipment technical maintenance subscriber installations and the pay-phone technical maintenance, automatic toll exchanges (ATE), ordered trunk lines (OTL), and trunks technical maintenance.

8.1.3. The telephone network technical maintenance could be realized in two ways: the decentralized and centalized one. In a case of decentralized way all kinds of works on technical maintenance are carried out by the staff, attached to a definit equipment and always present at the appropriate network object. The centralized way of technical maintenance supposes, that the equipment, placed in the various network objects is maintaianed by the staff, concentrated in one point - the technical operation center (O&M-center).

Independently of the technical maintenance way, when the software control nodes and exchanges are implemented, the programming centers and the repair centers of these exchanges should be created on the network.

8.1.3.1. The decentralised way of the technical maintenance is used in automatic toll and intrazonal telephone networks. The automatic toll and intrazonal exchange and nodes technical maintenance organisation control is realised by the control centres.

8.1.3.2. The centralised way should be the principal way of the urban telephone network maintenance organization. The two level O&M-centers should be set in the UTN (urban telephone network) with tandems: the nodal O&M centers and main center (O&M) - center) informationally interacting with them. If a rural-suburban nodes in UTN are present, the suburban zone O&M-center, informationally interacting with O&M-center should be created. UTN O&M center or O&M-center, maintaining all kinds of the urban telecommunication equipment may be created in UTN without tandem.

The technical maintenance of a rural telephone network (RTN) should be provided by O&M-center, maintainining all kinds of rural zone telecommunication equipment.

The united O&M-center, providing the technical maitenance of UTN and RTN equipment should be created in the combined telephone network.

Note. An application of decentralized mode of technical maintenance in UTN, supplied with CO and electromechanical systems nodes exceptionally, is possible if it is feasible.

8.1.3.3.The local telephone networks equipment technical maintenance centralization should be supported by:

- the availability of the technical means of control, diagnostics and verification for collection of information about equipment activity on the remote objects;
- the availability of the data-exchange facility with the use of channels, organized for this purpose, on the remote object and in O&M-center;
- the availability of the software and hardware facilities for storing and processing of input control and diagnostic information, in O&M-center;
- the presence of the specialists teams of specialists, supported by technical and transportation means in O&M-center;
- organization of centralized input and processing of subscriber's complaints about unsatisfactory quality of the connection.

Notes.1. It is possible that not every of mentioned above conditions is implemented on early stages of O&M-center organization.

2. The detalisation level and volume of control diagnostic information should be defined by the technical means of each of the remote objects and could be changed as function of their upgrading.

8.1.4. The telephone network technical maintenance may be realized with the use of two modes: the control-updating mode and the preventive one.

8.1.4.1. The control-updating mode of technical maintenance is based on continious automatic quality control and provides damages elimination after the control system indicates that maintenance quality characteristics are out of permissible standard limits.

8.1.4.2. The preventive mode of technical maintenance provides the performance of periodical planned equipment tests to detect and eliminate the damages before they can influence maintenance quality and to detect and eliminate the damage of equipment, occured during its operation.

8.1.4.3. The choice of a technical maintenance mode is determined by:

the equipment reliability;

the availability of equipment, indicating damage oppearance and damage rate and degree of its influence on call maintenance quality.

the availability of the control measuring instruments (KMI), permitting to detect the character and place of the damage;

the availability of means, permitting to provide the exchange (node) operation with evaluation of service quality.

when a certain number of damages have occured (the reserves available, reiterated search and so on);

the availability of automatic means for treatment and analysis of statistic data, receiv

ed from the control system.

8.2. The switching equipment technical maintenance

8.2.1. The switching equipment technical maintenance includes:

The call set-up quality and traffic control;

the switching equipment technical state control;

the definition of a part of equipment, where the damage has occured and the repairment (operation condition restoration).

8.2.2. The call processing quality and traffic control should be implemented with assistance of technical means giving a possibility of traffic parameters measurement and of call set-up quality rates correspondence to the assigned standards verification.

8.2.3. The switching equipment technical condition control must include the continious control and the periodical control.

The switching equipment portion controlled continiously is defined by the exchanges and nodes technical capability.

The damage and predamage state continious control should be provided in the exchanges and nodes of all systems.

8.2.4. The identification of a section and character of the damages occured should be maximally computerised. The damage place localization process up to the devise or and unit) must be completely computerised with the use of diagnostics programs in the software controlled exchanges and nodes.

Software and hardware control facilities should give the necessary information, concerning the damages character and the place of their occurence, either to O&M-centre or to special premises, where the maintainence staff of the exchange (node) is located. It's possible to indicate the damaged portion immediatly in switching room with the help of control-measurement equipment, available at the exhange (node).

8.3. The toll trunk lines and interzonal telephone networks technical maintenance.

8.3.1. The maintenance quality and switching equipment technical state control.

8.3.1.1. The switching equipment technical state control is implemented by the exchange personell by the signalling systems monitoring and control over the operation quality rates using both real calls and simulated ones i.e. created by the control-measuring instruments (CMI) and test commands. A condition of the switching equipment is considered as a normal one, if the operation quality rates are within determined limits and there is no signalling failures.

8.3.1.2. To the essential operation quality rates, continually controlled in the exchange (node) belong: a part of rejected calls (among them the calls rejected because of faults and damages in parts of equipment); call losses because of absence of an LSR idle channels and of the lines divided in given direction.

8.3.1.3. The switching equipment condition control is implemented permanantly with the help of hardware (embedded control curcuits) and hardwre-software facilities, giving the information about control results, to the centralised alarm and print-out facilities.

8.3.1.4. All signals formed by signalling equipment are subdivided into:

alarm signals (AS);

warning signals (WS);

the technical signals (TS);

The alarm signals are formed and dumped to an operation personell when the following consequences of equipment damages take places:

the exchange (node) activity completely ceased;

one of the reserved central units of the exchange is damaged;

the inadmissible deterioration at least of one of the principal operation quality rates is detected ;

the inadmissible exceeding of blocked devices number within the given type group or module is detected;

the inadmissible exceeding of blocked outgoing and incoming trunks number within one direction is detected.

The warning signals (WS) are formed and dumped to operation staff when the failure of a part of exchange (node) equipment is detected, and the faults being present, the exchange capacity is decreased so, that in the moment of traffic increase one of the damage situations can occure.

The technical signals are formed and dumped to the operation staff when the failure of one of reserved units is detected.

8.3.1.5. The print-out facilities (the electric typewriters in AMTC-2, AMTC-3 exchanges; the centralograph printer and punchers in AMTC-5 exchanges, the printers of the ATE and the ASN with software control) should register the information about the principal operation quality rates changes automatically, as well as the information, indicating the place and type of the damages occured (the stage, when the further call set-up is ceased or the repeated searching occured, the numbers of devices, taking part in the call set-up process etc.) - automatically or on the operation staff request.

8.3.1.6. When the principal operation quality rates are out of the permitted range, the technical staff can request the additional rates (the print-out information), permitting to analyse the main operation quality rates of exchange in the detaile and to control the activity of each separate kind of equipment.

8.3.1.7. Beside the permanent automatic switching equipment state control, the automatic control may be carried out in some ATE. It may be implemented by periodic tests started within a certain time interval simultaneously in several special incoming units, placed, as far as possible, in the different modules of the switching field (SF).

The control calls set-up quality is evaluated and exchange operation is estimated according to the tests consequences. When all calls can not pass the alarm signal is sent.

8.3.1.8. The technical maintenance of the switching equipment of exchanges and nodes with software control (AMTS-6, AMTS -7, AMTS-8 AMTS-10) must use the control-correction method.

It's possible to use the preventive technicalmaintenance method for special kinds of these exchanges equipment, not controlled automatically or controlled not completely.

The crossbar type exchanges (AMTS-5, AMTS-2 AMTS-3) must be maintained with the use of both control-correction and preventive method of maintenance, the step-by-step type system exchanges and nodes -using preventive method.

8.3.1.9. In future the toll trunk exchanges of the crossbar and the step-by-step ATE equipment technical maintenance should use automatic technical means.

As this takes place, the switching equipment state control should be implemented by means of CTEC complex (computer-based technology equipment control complex), which is the TP CCS (the technology processes control computer-based system and the MTE and ATE quality control) subsystem.

This should provide the possibility of the control-correction method of the switching equipment technical maintenance implementation on crassbar ATE and its partial implementation on the ATE of the step-by-step system.

8.3.2. The damaged section identification and damage elimination.

8.3.2.1. The section and the damage cause identification should be implemented by the operation staff of the exchange (node) on the basis of the continious and periodical control data, giving the information to a signalling systems and to a print-out devices.

8.3.2.2. The damage elimination in switching equipment must be implemented by means of replacement of invalid devices or units by the valid ones from the store of the spare tools.

The restoration of operation of the damaged switching equipment, the repair works should be done in special premises.

The detachable equipment small faults elimination and the elimination of the bus and any other attachable equipment damages can take place directly in the switching room.

8.3.2.3. The urgency of organization of the repaire work on the damage elimination is determined by degree of their influence on the exchange (node) activity as a whole.

With damages, causing the importent or complete break down of the exchange or its reliability importent reduction, the measures on their detecting reliability the measures on their detection and elimination should be taken immediately at any time.

With damages, causing the increase of calls rejection rate or important deterioration of the maintenance quality of incoming calls during busy hour, the measures on their detection and elimination should be taken immediately during working hours.

The measures on detection and elimination of the damages insignificantly influencing on the operation quality, should be taken immediately by the acting shift.

8.4. The Technical maintenance of the local telephone network communication equipment.

8.4.1. The local telephone network communication equipment control must include the call maintenance quality control using the same parameters for all switching systems as well as the equipment conditions technical control, carried out by the software-hardware facilities, specific for different types of exchanges.

8.4.2. The call processing quality control is implemented using CO technical means and the O&M-center technical means on the base of the estimation of the service quality rates, obtained by observing the real call stream with the help of the control calls and also by the traffic parameters systematic measurement results processing.

Note. The control calls are performed preventively, according to the schedule, assigned by O&M-center, and also with the purpose of the "bad" section localization in those directions, which were recognized as "bad" by continious control results.

8.4.2.1. The following call processing quality rates should be continiously controlled in UTN:

the part of connections unset because of the technical reasons in each outgoing direction;

the losses due to the the absence of free trunks in each outgoing direction;

By the choice and according to the schedule the following parameters are controlled;

the mean holding time and the outgoing traffic (total and in different directions);

the mean holding time and the incoming (total and in different direction);

the part of connections unset because of the technical reasons and the part of calls lost because of absence of available trunks, with their distribution over the network sections.

The call maintenance quality control is implemented by choice in accordance with the scnedule on CO and the step-by-step and crossbar systems nodes prior to O&M center implementation.

8.4.2.2. The call maintenance quality control is provided in RTN on the basis of:

the threshold control of the part of the calls, lost in each direction;

the mean holding time control in direction.

8.4.3. The UTN switching equipment technical condition control includes the continuous failures control, embracing all kinds of equipment and a periodical switching equipment function quality control.

8.4.3.1. The "alarm" and warning signals must be provided by damage condition control (CCITT Recommendation (Q.504). The alarm and warning signals are transmitted to O&M-center over specially assigned channels with reservation.

8.4.3.2. The step-by-step type CO equipment operation quality control should be based, mainly, on the searchers efficiency parameters. Besides, the statistical control of the line set validity on the mean holding time should be provided.

The crossbar CO equipment function quality control includes the statistical control of the number of connections, not set-up due to technical reasons, the statistical control of the line units validity based on the mean holding time and the statistical homogeneousness control of the numbers, received and transmitted by registers.

Software controlled CO equipment function quality control is implemented by means of their software and hardware and should be based on the use of statistical methods (mainly with the track control) and the test verifications (mainly with the control sets control).

8.4.3.3. All information received at the UTN switched equipment function control (except the damage and warning information) should be stored (and partly processed) by CO technical facilities and transmitted to O&M center.

8.4.4. The RTN switching equipment technical conditions control includes the continious damage condition control, embracing all kinds of network equipment, and the periodical equipment control in order to receive the diagnostic information.

The routs either formed by the way of "interception" of the RTN interexchange channels, or organized on channels specially dedicated for these purposes from the common bunch of interexchange communication channels are used for the continious and periodical control results transmission to O&M center. The single one frequency method of data transmission with decadic coding should be used in RTN to provide the interaction of the different systems technical facilities.

The possibility of the imformation exchange by this method must be present in each O&M-center; the other methods may be used for interaction between the technical facilities of the same type.

8.4.5. The information, coming to O&M-center from the local network exchange should be processed on and distributed over the specialized services. O&M-center receives the operational information about the emergency situations of various degrees of importance and about the situations requiring the additional operations for the failure diagnostics, as the result of the continuous control.

8.4.6. When O&M center is organizing the works there are three categories of the repair works accomplishment from the point of view of their urgency:

the immediate repair

the 24 hours repair

the any time repair.

8.4.7. The UTN O&M-center zone of responsibility capacity may be up to 300 000 extensions. The principal technical operation centers - O&M centers are organized in UTN of a large capacity.

8.4.7.1. The principal O&M-center functions must consist of:

the receiption and mapping of the emergency signals and the failures elimination organization;

the receiption, treatment and analysis of information about the traffic and the call maintenance quality results;

the operational network equipment function and condition control;

the maintenance zone subscribers servise requests receiption, the verification and fault elimination;

the fault diagnostics works, restore and scheduled repair works fulfillment in the maintenance zone;

the restore works fulfillment control;

the control calls management;

the results processing and analysis;

the operation documentation acquisition, processing and analysis.

The centralized technical operation system facilities maintenance;

the technical reports composition;

the interacting with the telephone network administration of the higher level.

8.4.7.2. O&M-center should manage the whole UTN technical operation management on the base of the incoming information from O&M center.

The general O&M center functions include:

the operational-dispatching telephone network function control;

the operational connection with the urban and O&M center dispatch services;

the telephone communication parameters data collection and analysis for the traffic forecasts and design;

the crosspoint and the data transmission control and technical maintenance;

the interaction with the telephone network administration of higher levels.

Note. O&M center must include the special service for the UTN cables technical maintenance.

The data communication systems technical maintenance is executed either by O&M center or by O&M center services on the large networks.

8.4.8. The rural telecommunication centralized technical operation system development should be implemented stage by stage according to the centralization scale: within one administrative district territory , with O&M center;

the centralization within the region or union republic with regional O&M-center, the centralization on the Ministry of communication of the USSR level with main O&M-center.

8.4.8.1. The functions of the O&M-center, maintaining the administrative district territory should be:

the failure signals detection and localization of the failures, repairment actions organisation;

service quality control and traffic data collection, processing and analysis;

the network equipment functioning and condition operational control;

the diagnostic information collection, storage and analysis;

the calls maintenance quality control;

the remote checks realization;

the repair works control;

the technical accounting conduct;

the network improvement work planning and these works control.

8.4.8.2. RO&M center must fulfill the region main center functions and realize, in connection with it, a few ones of district networks technical operation control on the basis of the processed data, received from each administrative district O&M center. The district telecommunication networks function quality and their improvement and development is a purpose of administration.

The programming centre for CO with the program control should be the integral part of RO&M-center. RO&M-center should fulfill, in connection with it, the operational exchanges software attending functions, among them, a change of the existent programs and a debugging of the new ones.

8.4.8.3. The MO&M center's problems are determined by the USSR Communication Ministry problems and they should to be decided on the basis of the processed and integrated information about the telecommunication facility functions.

8.5. The Telephone Network Switching Equipment Repair.

8.5.1. The telephone network switching equipment repair is the equipment efficiency and validity recovery operations complex.

There are the following kinds of the toll, intrazonal and the local telephone network switching equipment repair:

the capital repair (for the electromecanical systems exchanges),

the average repair,

the current repair.

8.5.1.1. The capital repair is a repair, fulfilled for the validity recovery and complete or almost complete equipment resource recovery with any of its parts restoration or replacement, basic ones included.

The capital repair is fulfilled periodically and depends on the established interrepair cycle and on the equipment technical condition and it is planned in each individual case depending on the technical checks data and on the defects list worked out in accordance with these data.

The switching equipment may be modernized during capital repair actions, if it's feasible from and economical and technical point of view.

8.5.1.2. The mean switching equipment repair is a repair, fulfilled for the validity recovery with the replacement or recovery of the limited number of components described by the standard technical documentation. The electromechanical systems switching equipment mean repair period is determined by its technical condition.

8.5.1.3. The exchanges and tandems equipment current repair is a repair fullfilled by the way of the damages elimination immediately during equipment operation , and realized for its operability providing or recovery (with or without the spare parts use).

8.5.2. The exchanges of different systems and tandems switching equipment repair may be implemented by the maintenance or specialized organization.

8.5.2.1. The electromechanical exchanges tandems switching equipment current and mean repair is fulfilled by the maintenance organization and the capital repair is fulfilled by the specialized organization.

8.5.2.2. The software controlled exchanges and nodes current repair is fulfilled by maintenance organization and it is fulfilled by the specialized organization (or under its administration) in the case of especially complicated damages, for instance, of the centralized control equipment.

8.5.2.3. The software controlled exchanges and tandems equipment mean repair is implemented by the maintenance organization, having a specialized repair workshop, or in the repair centre (RC).

8.5.3. The functions of the software controlled eschanges and tandems RC should comprise:

the software controlled exchanges and tandems equipment mean repair;

the software controled exchanges and tandems repair workshops administration;

the repair centres may also fulfill the staff training, equipment and documentation updating functions.

8.5.4. The software controlled ATE switching equipment repair should be organized on the base of specialized repair service (RS), which functions in accordance with a kind and contents of repair, must be fulfilled by:

the software controled ATE maintenance personell staff;

the repair workshop (RW) staff;

the repair centre (RC) staff.

8.5.5. The local networks equipment switching repair center is targeted to centralized software controlled exchanges and nodes faulty RU (replaceable unit) repair.

8.5.6. The RCs number, necessary for one type of exchanges maintenance is determined by the intensity of failures stream on these exchanges, leading to the replacement of the invalid RU by the valid ones from the spare parts store on these exchanges, and it is determined by the repair output in RC defined by it's equipment. The capacity of the zone being served by one RC may be defined roughly taking into account that there should be:

one RC per a zone from several UTN districts, the total capacity of 200-300 thousand numbers.

one RC per a rural administrative district.

one RC per UTN 400 thousand numbers capacity.

For the future the capacity of a RC service zone must be defined more accurately accordingto the service quality.

8.5.7. The presence of CR for the exchanges produsedaccording to licenses be stipulated in a contract.

8.5.8. The RC functions include:

the invalid RU acquisition from the exchanges and nodes presented in RC maintenance zone and their delivery to the centre;

the failure diagnostics and the invalid units localisation in RU;

the RU damage elimination;

the restored RU operating test in RC conditions;

the repaired RU transportation to the exchanges;

the CO equipment immobile units complicated damages diagnostics and elimination by the forces of the obile repaire brigade;

the centralized booking of reserved RU from the plant-supplier;

the collection and analysis of the statistical information about the damages, on the tandems and CO equipment during operation, with a purpose of these information transmission to the plant-supplier quality control service.

8.5.9. The RC should be organized at the plant-supplier of CO for each of these exchanges family separately.

8.6. The pay-phones and subscriber facility technical maintenance.

8.6.1. The subscriber facility is a set of equipment including:

the subscriber line (from the CO cross to the telephone set socket);

the CO subscriber complex and subscriber terminal facilities, including: the telephone set (with a socket), diode-transistor multiplexing devices , the additional telephone rings.

Note. The subscriber facilities, connected to the telephone network include: (besides or istead of telephone sets) nontelephonic terminal facilities (data transmission, facsimile sets...)

The technical maintenance of these terminal facilities by the technical maintenance system is not provided by PSTN.

8.6.2. The technical maintenance of the UTN subscriber facillities should be implemented by the forces of the centralized telephone network workshops of the subscriber technical service - CSTS, which are the industrial subdivisions of the technical operation centers.

8.6.3. It is necessary, for the CSTS functions fulfillment, to have the equipment which provides:

the collection of the subscribers complaints from any centralized maintenance zone terminal about the lines or the telephone set damage;

the automatic subscriber line or telephone set testing on the number, requiring verification with the testing results delivery to the complaining party.

the complaining subscriber facilities condition description in reference-informational file of centralized service with these information delivery to subscriber.

the damage elimination work control;

the automatic accounting of registered and satisfied complaints with a note about the statement entry and the damage elimination time.

the complaints and the subscriber lines and facilities damages data statistical processing.

8.6.4. The technical maintenance of RTN subscriber facilities should be carried out in a centralized way. The subscriber lines automatic control should be provided by the technical facilities of O&M-center (for the terminal and central offices - the remote one), indispensable consequence of which should be the damaged section indication (the exchange or line side).

8.6.5. The UTN pay-phone technical maintenance should be carried out by the centralized way and it must be fulfilled by the forces of a special centralized pay-phones operation services (CPOS).

8.6.6. The CPOS should implement the continious automatic remote control of the function of the pay-phones, connected to their maintenance zone, the invalid pay-phones indication; take measures to repain indicated damages and to recover the pay-phones operation; account and analyse damages and develop recomendations and statements on the pay-phones operation improvement.

8.6.7. O&M-center should be supplied with the pay-phones centralized control facilities to fulfil its functions.

The centralized control facilities of the pay-phones connected to CO of the existing systems or to the software controlled CO, should provide the following functions fulfillment:

the pay-phones lines and the control circuits permanent continuity check in CPOS maintenance zone;

the indication of the pay-phones which have not been occupied during the determined time interval;

the definition of the pay-phones in which the short-duration conversation states are observed systematically;

the automatic acquisition of information about the pay-phones damages and their operation restoration.

8.6.8. The RTN pay-phones technical maintenance should be carried out in a centralized way.

The pay-phones performance automatic control implemented within the telecommunication facilities continious control should be based on the holding time statistical control method and it should provide the control results transmission to O&M center.

8.6.9. The preventive method of the MTA connected to Cos and ATEs technical maintenance,should be used. The MTA technical condition control is implemented on the base of the preventive measures and complainnts, offered by users and pay-phonecentres employees.

8.7. The telephone channels, toll trunk lines (TTL), ordered trunk lines (OTL) and trunks technical maintenance.

8.7.1. The telephone channels, toll trunk lines (TTL), ordered trunk lines (OTL) and trunks technical maintenance is implemented by the control-correction method with keeping of the periodical control and with the primary network operation principles and the other interacting systems, including the network control system observation.

The preventive maintenance method is possible (in ATE-2, 3).

The exchanges (tandems), for which this switching section is outgoing are responcible for the toll trunks, TTL, OTI, trunks technical maintenance organization.

The outgoing exchange (tandem) provides: the telephone channels, TTL, OTL and trunks condition control using determined parameters and their technical condition maintenance according to corresponding standards.

the damage sections indication;

the damage elimination control.

8.7.2. The telephone channels, TTL, OTL, trunks technnical maintenance is based on their condition control. The cannels, TTL, OTL and trunks control is subdevided into the continious and periodical controls:

the continious control includes:

the row, frame and individual fuses burning out on the TTL, OTL and trunks telephone channels line sets frames control;

the technical signalization supervision;

the damages number standard value exceeding on the software controlled exchanges channels control.

The periodical control includes the periodical channels, TTL, OTL and trunk tests with the automatic control measuring instruments (CMI) help.

8.7.3. The channels, toll trunk lines, ordered trunk lines conrol general items.

8.7.3.1. The telephone network control is intended for the network operational parameters keeping within the operational standards limits.

8.7.3.2. The telephone network control is implemented on the switched sections, separately and independently for channels, IAR, LSR, ordered trunk lines (OTL) toll trunk lines (TTL) sections.

8.7.3.3. The switched sections control provides the routs or individual channels (lines) verification. The channels (lines) control is implemented periodically or at the technical staff request in the case of the damages numbers exeeding standard values.

8.7.3.4. The channels and lines control is implemented in the exchanges and nodes automatically with the help of the control measurement instrumentation (CMI) or dedicated and exchange software and hardware facilities.

8.7.3.5. The network switched sections automatic control provides the verification of channels unoccupied by connection, together with line sets. The damaged section identification is not performed then.

8.7.3.6. The telephone network switched sections control is performed in the following modes:

the assigned channels line periodical control according to a schedule;

the channels (lines) control on demand;

the assigned channels (lines) sampling control;

the unuque and multiple control at the verification according to a schedule and on demand.

8.7.3.7. The network section control is implemented by the way of the control connection set-up from the control measurement instrumentation (CMI) or the software-hardware facilities of outgoing exchange to the incoming exchange software-hardware facilities or CMI over the controlled switched section.

8.7.3.8. The CMI response part or appropriate equipment facilities of the incoming exchange are connected to the controlled switched section via the exchange tandem switching network.

8.7.3.9. CMI or software-hardware facilities of outgoing exchange transmit to the incoming exchange the CMI responsive part number, the special informational signals, defining the mode and the sequence of verifications and the other information, concerning measurements.

8.7.3.10. The CMI or software-hardware facilities of incoming exchange transmitt special informational signals and measurements results data to the outgoing exchange.

8.7.3.11. During the control connection set-up through the controlled network section, the line and control signals transmission is verified and transmission characteristics are controlled (for the analog channels - attenuation on frequencies 400, 800 (1000), 2800 Hz, the psophometric noises; for the hybrid (analog-digital) channels attenuation on frequencies, which are not discretezation frequency multiples the psophometrical noise voltage, total distortions, including the quantization distortion).

Notes. 1. The psophometrical noise measurement should be performed if the overall loss does not exceeds the standard.

2. The digital channel transmission characteristics control recommendations are to be developed in future.

8.7.3.12. The both transmission directions network switched sections verifications results registration, collection, analysis and estimation are performed on the outgoing exchange.

The volume of the registered information includes:

the controlled section conditional number; the testing time and the date;

the testing programm conditional number; the signalization testing results;

the transmission characteristics testing results.

the fault channels number exceeding the standard in a route (for the control updating method).

8.7.3.13. The automatic CMI or the software-hardware is providing the network switched section blocking possibility at the negative testing results estimation. In the individual cases the operation without automatic blocking from automatic CMI is possible.

8.7.3.14. The acquisition, statistical processing and analysis of the network switched sections control data is organized on the outgoing exchange, and the equipment function standard operating measures are defined on the foundation of data analysis.

8.7.3.15. The exchange monitoring signalization possibility based on the route control data analysis should be provided for the control-updating method.

8.7.3.16. The technical staff should start immediately localisation of the sections and causes of damages and restoration of the network switched sections efficiency in case of deterioration of the service quality or in case of invalid channels number exceeding the norm.

8.7.3.17. The control data are analysed after each control cycle when preventive maintenance method is used. The technical staff finds out the sections and causes of the damage, eliminates these causes and restores the network switched section efficiency.

The network section is considered as valid one, if the network section damage isn't confirmed at a repeated control.

8.7.4. The telephone network channels control.

8.7.4.1. The definition of the secondary telephone network channel fitness for the service is a purpose of a control.

8.7.4.2. The automatic toll exchanges (ATE) and nodes provide a control of outgoing and incoming channels both equiped and not equiped with echo cancellers, formed by the analog and digital transmitting systems with in-band signalling and with common-channel signalling (CCS).

Note. The channel control system in CCS should be developed in future.

8.7.4.3. The toll exchanges and nodes provide the control of outgoing and incoming channels with one-voice frequency and two-voice frequency signalling systems as well as with channel associated signalling.

8.7.4.4. The automatic CMI or software-hardware facilities connection to controlled channel is provided for a four-wire route in minus 3.5 dB0 point; in digital exchanges-in 0.0 dB0 point.

The CMI connection to two-wire switching point is possible.

8.7.4.5. The outgoing CMI or the exchange software-hardware facilities determine the numbers of channels, subjected to control, control program, control mode, the controlled channels parameters standards.

8.7.4.6. The automatical CMI or the exchange or tandem dedicated software-hardware facilities provide the frequency and time division channels control according to CCITT Recomendation Q.22 vol.IV.2 of the Red book. The channel control in accordance with CCITT Q.22 Recomendation vol.IV.2. of the Orange book , Q.21 vol.IV.1 of the Green book and channel control by ЂЏЈЂ program on ATE-2, 3 excheges is possible.

8.7.4.7. CMI or the exchanges (tandem) software-hardware facilities fulfill the channel control by N.1, 2, 5, 6 programms. The channel control by N3 and N programs is possible.

The program characteristics are in the table 8.2.

8.7.5. (TTL) toll trunk line control.

8.7.5.1. The ATE provides the control of all directions of toll trunk line, connected to the exchange and the control of all lines of each direction.

As this take place, the physical and multiplexed TTL control is provided.

8.7.5.2. The TTL control is performed from a switching point, to which the TTL outgoing end is connected, up to the CO subscriber stage.

The TTL section from ATE to TITT is defined by a fixed number of controlled TTL, the TTL section from TITT to the subscriber stage is arbitrary.

8.7.5.3. The outgoing exchange provides TTL special numbers control, for this purpose the automatic CMI or exchange software-hardware connection to TTL assigned numbers is accomplished.

TTL routs control with the arbitrary TTL choice in the direction is possible.

8.7.5.4. The CMI or software-hardware facilities for TTL control are interfaced with answerback device, set in CO and connected to CO as a subscriber.

8.7.5.5. The TTL routs numbers, the TTL numbers, subjected to control, the control mode, the parameters values are assigned by CMI or by the ATE software-hardware facilities.

8.7.5.6. TTL control is implemented by the way of control connection set-up, from CMI or ATE software-hardware facilities via controlled TTL to the answerback device.

8.7.5.7. The line and control signals and characteristics of bidirectional transmission are controlled across the assigned standards during the control connection.

8.7.5.8. The TTL overall loss (attenuation) and the psophometrical noises tension are related to the TTL transmission controlled characteristics.

For the analog-digital systems TTL, the summary distortions (the quantization distortions including) are controlled additionally.

8.7.5.9. The transmission parameters norms are set in accordance with the operational norms for the TTL of assigned direction.

8.7.5.10. CMI or ATE software-hardware facilities provide the following TTL control programs: N.1, 2, 3,, 5.

The programs characteristics are in the table 8.3.

8.7.5.11. The TTL control results are stored processed and analyzed in ATE. The measures for standartisation and improverment of TTL operation are organized on the basis of the verifications data analysis. The CMI list for the diferent exchanges control is in the table 8.4.

8.7.6. The Ordered Trunk Line Control.

8.7.6.1. CO, RSN, OTT or OTLN should provide the automatic control of ordered trunk lines by CMI facilities or by a set of assigned and exchange software-hardware facilities of the exchange or the node.

OTL control is accomplished from CO to ATE if the tandems are absent. OTL control is implemented in two steps:

from a tandem to ATE and from CO to ATE, when the tandems (network or switching ones) are present.

8.7.6.2. Physical and multiplexed OTL must be controlled by the way of setting of control connection from CMI or from CO or the tandem software-hardware to ATE answerback device connected to ATE switching field or to the ATE software-hardware.

8.7.6.3. CMI or software-hardware connection to OTL assigned numbers must be provided in CO and nodes.

8.7.6.4. Automatic CMI or appropriate software-hardware connection to OTL outgoing section is be provided in the network and switching nodes. CMI or the software-hardware of the network node must be connected to OTL in a break with the disconnection the of OTL part, directed to the CO side. CMI should be connected to the input of outgoing line unit.

8.7.6.5. The CMI of CO and the nodes or the appropriate hardware are interfaced with the answerback device of ATE or the software-hardware set, connected to he ATE swithing field.

8.7.6.6. The OTL numbers, subjected to verification, the control program, the control mode are assigned by CMI or by CO and tandem software hardware facilities.

Table 8.1. The channels control programs characteristics

Prog-ram	Fulfilment of MKKTT requirements	Test type	Transmission characteristics measurements	Measuring signal level	Measurements result delivery
1	2	3	4	5	6
N1	Fulfills the Q.22. Recommendations vol.IV,2, of CCITT Red book	line and control signalling functional tests, except for signal BUSY	Overall loss on 800 (or 1000Hz)	-10 dBmO	Absolute signal power level on 800Hz frequency as deviation (in dB) from 800 Hz power absolute level nominal value in the switching point with deviation sign indication
			Gain with frequency variation on 400, 800 (or 1000) 2800 Hz	- 10 dBmO	Absolute signal power level on 400, 800, 2800 Hz frequencies as deviation from absolu-te power level, measued on frequency of 800 Hz with deviation sign indication (for analog-digital channel on frequencies not multiple to sampling frequency)
			Psophometrical noise Ratio signal/summary distortions including quantization distortion		Absolute level of psophometrical noise relative to zero level, dBmOP

1	2	3	4	5	6
N2	Fulf.CCITT Q.22 Recommendations, vol.IV,2, of Orange book	Functional Line and control signalling tests, except for signal BUSY	Accumulated loss on 800 Hz	- 10 dBmO	Absolute signal power level on 800Hz frequency as deviation(dB) from 800 Hz power absolute level nominal value in the switching point with deviation sign indication
		Gain with frequency variation on 400, 800, 2800 Hz		- 10 dBmO	Absolute signal power level on 400,800, 2800 Hz frequencies as deviation absolute power level, measured on frequency of 800Hz with deviation sign indication
				Psophometrical noise	Absolute level of psophometrial noise concerning zero level, dBmOP
N3	Fulfills CCITT Recommendations Q.22,vol.IV	Functional line and control signalling	Overhall loss on 800 Hz gain with frequency variation on 400, 800, 2800 Hz	0 dBO	Absolute value Absolute value
	1, of Green book	tests,except of signal BUSY	Psophometrical noise		Complaine with tolerances
N4	Does not fulfil CCITT Recommendations is used during channel tests by ATE-2, 3	Functional line and control signalling tests	Overall loss on 800 Hz Psophometrical noise	0 dBmO - 10 dBmO	Compliance with or tolerances Compliance with tolerances
N5	Does not fulfil CCITT Recommendations	Line and control signalling tests. Shortened signalling test at CMI absence on incoming end is possible	-	-	-
N6	Does not fulfil CCITT Recommendations	Signal BUSY control	-	-	-

Table 8.2. Characteristics of CMI operating programs, control modes, CMI interacting and CMI answering parts numbering plan

Outgoing exchange type	CMI outgoing exchange type	Control modes provided by outgoing CMI			Damaged channel blocking	Controlled changenels signalling system	Incoming exchange type	Incoming exchange CMI type	Answering CMI name (ANSWER)	Control program N, provided by outgoing CMI	Incoming exchange CMI answering part numbers
		in cycle	single control	multiple control							
1	2	3	4	5	6	7	8	9	10	11	12
АМТС-8, QE ASN	CMI АМТСКЭ or АКИАЭ	pro-vides	provi-des	provi-des	-	one frequ ency	АМТС-8	АКИАЭ *	ANSWER ANSWER	2 5	443 449
							АМТС-9	АКИАЭ	ANSWER	2	443
							АМТС-5	АТМЕ-1	ANSWER	5	449
							АМТС-6		АТМЕ-В	3.5	442
							АМТС-7	АТМЕ-1	R	3	442
									ANSWER	5	449
							АМТС-10	program	АТМЕ-В	3	442
									ANSWER	5	449
						two frequency	АМТС-2,3	АПКА	АПКА-УВ	4.5	441
АМТС-2,3	АПКА	pro-vides	provi-des	provi-des	provides	two frequency	АМТС-8	АКИАЭ*	ANSWER	4.5	441
							АМТС-9	АКИАЭ	ANSWER	4.5	441
							АМТС-5	АПКА	АПКА-УВ*	4.5	441
							АМТС-6				
							АМТС-7	АТМЕVТ	R	4.5	441
							АМТС-10	АПКА-	АПКА-УВ*	4.5	441
АМТ С-5,6	АТМЕ-1	pro-vides	provi-des	-	-	one frequ ency	АМТС-7,8 АМТС-9		ANSWER	3.5	442
						two frequency	АМТС-5		ANSWER	3.5	442
							АМТС-6	АТМЕ-1	АТМЕ-В	3.5	442
							АМТС-7				
							АМТС-10	АТМЕ-IN	R	3.5	442
								program	АТМЕ-В	3.5	442
						two frequency	АМТС-2,3	АТМЕ-1	АТМЕ-В*	3.5	442
АМТС-7, QE ASN	АТМЕ-2	pro-vides	provi-des	provi -des	-	one frequ ency	АМТС-7	АТМЕ-2	ANSWER	2.5	-
	АТМЕ-IN	-"-	-"-	-"-	-	one frequ ency	АМТС-8	АКИАЭ *	ANSWER ANSWER	3 5	442 449
							АМТС-9	АКИАЭ	ANSWER	3	442
									ANSWER	5	449
						two frequency	АМТС-5	АТМЕ-1	АТМЕ-В	3.5	442
							АМТС-6				
							АМТС-7	АТМЕ-1	R	3	442
									ANSWER	5	449
							АМТС-10	program	АТМЕ-В	3	442
									ANSWER	5	449

Table 8.2. (cont.)

1	2	3	4	5	6	7	8	9	10	11	12
ATMC-10, QE ASN	exchange software and hardware facilities	pro-vides	provi-des	provi -des	-	one frequ ency	AMTC-8	АКИАЭ *	ANSWER	3	442
									ANSWER	5	449
							AMTC-9	АКИАЭ	ANSWER	3	442
									ANSWER	5	449
						two frequency	AMTC-5 AMTC-6	ATME-1	ATME-B	3.5	442
							AMTC-7	ATME-1	R	3	442
									ANSWER	5	449
							AMTC-10	program	ATME-B	3	442
									ANSWER	5	449
						two frequency	AMTC-23		АПКА-УВ**	4	441
The ex-changes of all ty-pes at in-teraction with cro-ssbar ex-changes	CMI of all types or software-hardware facilities					one frequ ency two frequency	all types of excha-nges at interacti-on with crossbar exchang	CMI is not used		(BUSY signal control)	440

Notes:

1. АПКА-УВ*, АПКА-УВ** и АТМЕ-В* - and АТМЕ-В - the equipment, adjusted for operation in the indicated exchanges.

2. The combination 14 is used as AMTC-5 – 10 exchanges outgoing to CMI.

3. The use of number ABC 89 is possible in the frequently used exchanges during channels control by ATME program.

Table 8.3. CMI programs characteristics on TTL control

Prog-ram	Type of test	Transmission measurement and control	Transmitted signal measure ment level	Measurements result presentation
1	2	3	4	5
N1	Functional line and control signalling test,including the REPEATED CALL and BUSY signals	Overall loss (attenuation) measu-rement on 800 Hz Psophometric noise measurement	- 10 dBnO or 0 dBmO	Compliance with standard tolerances Compliance with standard tolerances
N2	Functional line and control signalling test,including the REPEATED CALL and BUSY signals	Accumulated loss (attenuation) mea-surement on 800 Hz	- 10 dBmO or 0 dBmO	Compliance with standard tolerances
N3	Functional line and control signalling test,including the REPEATED CALL and BUSY signals	Speech path control for frequence signal transmission	-	-
N4	Line and control signalling functional tests (till RELEASE)	Speech path control for frequence signal transmission	-	-
N5	Route operation quality control	-	-	-
N6	Functional tests of SUBSCRIBER IS FREE, ANSWER signals	Receiving path at tenuation control	-10dBmO (425Hz) -7,3 dBmO (700 and 900 Hz)	Absolute values

Table 8.4. CMI list the various exchanges TTL control and the controls provided by them

ATE Type	MCI type in ATE (russian abr.)	MCI type in CO (russian abr.)	Type of connection to TTL	Numbers of programs, provided by CMI
AMTC-7, 10	CMI AMTCKЭ or AKИAЭ with АПСЛ program АПСЛ term. trunk TT	АО-АПСЛ	Connection to TTL assigned in cycle or on the demand	1, 2, 3, 4
AMTC-2, 3	АПСЛ term. trunk TT	АО-АПСЛ	Connection to TTL assigned or on the demand	1, 2, 3
AMTC-5	ATME	any AO-ATC	Connection to TTL assigned	
AMTC-6	TPT TVP	CA CA	Connection to the TTL bunch arbitrary line	
	ATME	any AO-ATC	Connection to the TTL assigned	
AMTC-7	ATME	any AO-ATC	Connection to the TTL assigned	1, 2, 3, 4
	ATME 2VF	АО-АПСЛ	Connection to the TTL assigned in cycle or on demand	

8.7.6.7. The line and control signalling and the bidirectional transmission characteristics, namely overall loss (attenuation) and the psophometrical noise voltage are verified during the OTL control. For the analog-digital transmission systems the summary distortion (including the quantization noise) should be additionally controlled.

8.7.6.8. The transmission parameters norms are instituted in accordance with the operational norms for the given OTL direction.

8.7.6.9. Automatic CMI or CO and tandems software-hardware facilities fulfill OTL control by the programs N:1 and N:2.

8.7.6.10. The answerback device of ATE or software-hardware facilities of ATE provide the OTL control by the programs 1, 2, 3. The program N3 is purposed for OTL verification with the manual test instrumentation. The program characteristics are in the table 8.5.

Table 8.5. CMI programs for OTL control characteristics

Test program	Type of test	Measurement and control transmis sion	Measrements results de i livery
1	2	3	4
N1	Functional line and control signalling test	Overall loss (attenuation) measurement	Compliance with standards
		Psophometrical noise measurement	Compliance with standards
N2	Functional line and control signalling test	Speech path control by means of frequency trans mission estimation	
N3	Functional signalling test during OTL control by the manual imeans	-	-

8.7.6.11. The control by means of manual measurements of CO and tandems and the OTL controls is, implemented by means of the control sets, used in addition to the OTL control by the automatic CMI.

Notes:

1. The automatic CMI for OTL control is not available now.

2. The ЂЊ"-7, ЂЊ"-10, exchanges for the manual OTL control require the special software development.

8.7.7. The trunks control.

8.7.7.1. The trunks control is implemented by means of CMI, set in CO and it depends on CO type.

8.7.7.2. The trunks, outgoing from the step-by-step system CO should be controlled by means of special facilities and of the answerback device, set in CO.

8.7.7.3. The equipment operation is firmware controlled and provides the control of:

line signals

control signals

700 Hz signal frequency both-way transmission control.

8.7.7.4. The trunks outgoing from urban crossbar CO1 are verified by means of semi-automatic special equipment intefaced with the answerback device. This equipment provides automatic one-way lines control, but it requires manual switching from one direction to another. On the crossbar CO the automatic sets and trunks efficiency control by the holding time measurements should be provided.

9. NETWORK MANAGEMENT SYSTEM

9.1. Management system of intrazone, local and toll telephone networks should provide optimum service quality during failures and conqestions by effective application of all telephone network facilities.

9.2. Management system of local, intrazone and toll telephone networks should be designed considering principles of networks construction.

9.3. Toll and intrazone network munagement should be performed by:

main management center of a toll telephone network (ГЦУМС);

territory management and control centers of a toll telephone network (ТЦКУ);

zone management centers;

9.4. ГЦУМС management of national toll telephone network should be based on information about service quality rate variations in:

- LSR groups between ASNs;
- LSR groups from ASNI to ASNII or ATE;
- LSR groups from ATE to ASNII or ASNI;
- IAR groups from ATE to "other" ASNI;
- centralized (group) devices of ASN or terminal tranzit ATEs and also on information about total conditions of ASNI, ASNII and terminal tranzit and terminal ATEs.

The information specified is transmitted to выфож from ТЦКУ.

9.5. Жыиф should manage a toll network within specifeed territory by ГЦУМС instructions and also by information about occurrence and cessation of service quality variances in:

- LSR groups and individual large DR groups within own territory;
- centralized (group) control devices of ASNI, ASNII and ATE within own territory;
- exchanges and nodes of own territory.

Information on ASNI, ASNII, terminal-transit ATEs and routes involved is direct transmitted to ТЦКУ from ASNI, ASNII and terminal-tranzit ATEs. Information on the states of ATEs and routes involved is transmitted to ТЦКУ from zone management center (ZMS) (ATE) of own territory. ТЦКУ should be organized on every territory served by ASNI or terminal-transit ATE.

9.6. ZMC should manage the telephone network of its own zone by information based on occurrence and cessation of service quality rate variances in:

- channel groups and lines of intrazone networks;
- large DR and IAR of toll networks;
- centralized (group) control devices of own territory, ATE;

- ATEs of own zone on the whole.

ZMC should be organized at ATEs of regional (territory republic) centers. In case of several ATEs being avialable inregional (territory, republic) center, ZMC is organized at one them.

Prior to ZMC organization passible volume of its functions could be carried out by technicians of ATE.

9.7. Management system should include:

- sub-system for control of call handling quality and state (availability) of exchanes and nodes;
- sub-system for transmission of information displayed by exchanges-and nodes;
- sub-system for transmission of information displayed by exchanges and nodes to network management centers and transmission of network management instructions;
- sub-system for network state indication in management centers;
- sub-system for network state analysis and forming of network management instructions;
- sub-system for network management instructions implementation.

9.8. Sub-system for control of call handling quality and state (availability) of exchanges and nodes provides for state monitoring of the following controlled equipment:

- exchanges and nodes on the whole;
- centralized (group) equipment of exchanges and nodes;
- outgoing routes included into exchanges and nodes.

9.9. Sub-system for transmission of information displayed by exchanges and nodes to network management centers and transmission of network management instructions provides for automatic transmission of network state information to network management centers and both automatic and semi-automatic operator-assisted transmission of directive commands to lower rank control centers.

9.9.1. Data on network state and network management instructions is transmitted:

- at ГЦУМС-ТЦКУ spans-by dedicated non-circuit-switched telephone channels (with backup). Toll telephone network is used as additional backup;
- at ТЦКУ-ZMC spans of own zone - by dedicated non-circuit switched telephone channels.

National Telephone network is used as a backup.

9.9.2. Taking into consideration the importance of network state information, it has priority for transmission via national automatic switched telephone network using all its opportunities.

9.9.3. For information transmission between management centers these are assigned numbers of the type ABC or ABC8x.

9.9.4 For controlled equipment identification in management centers the latter should receive from exchanges and nodes information of the type ABCD MNKE, where:

- ABC is the code of forwarding exchange (node) zone,
- D is the number of forwarding exchange of the zone,
- MNKKE is the controlled equipment number.

9.10. Indication of management results to management centers personnel is carried out by indication sub-sustem including:

- indication panels;
- displays;
- printers.

9.10.1 Indication panel shows KO states infomation of the type: standard, non-standard 1, non-standard 2.

9.10.2 Displays and printers are intended for detailed information on controlled entity states.

9.10.3. Possibility of additional displayed and printed information acquisition is provided.

9.11. Management centers should select control methods and provide directive instructions based on network state analysis.

9.11.1 Network state analysis and generation of commands for network management could be automatic (supported by computer) or semiautomatic. In case of semi-automatic version network management is performed by commands pre-developed by management center personnel and stored in comuter memory.

9.11.2. Different methods of network and traffic flows management could be used depending on the network state.

9.11.3. Toll telephone network management could be performed by:

- changing channel groups capacities;
- forming new direct routes and bypasses.

9.11.4 Management of network traffic flows could be performed by:

- incoming traffic limiting;
- redirection of traffic.

9.12. The system for network management comands execution consists of devices designed for commands execution and located at exchanges and nodes.

Note: At program controlled eschanges and nodes directive commands could be software-based.

9.12.1 Network management commands could be executed, using either automatic or semi-automatic (operator-assisted) method.

9.12.2. In management centers documentation should be provided both for control data and network management commands.

9.13. The centers should be equipped with approrriate hardware to execute network management functions.

9.13.1. Off-line equipment should be used for ZMC organized at program controlled terminal exchanges and for ТЦКУ and выфож, as well.

9.13.2. Engineering facilities of ZMS organized at terminal step-by-step and crossbar ATEs should be (both with engineering facilities of automated system for ATE equipment maintenance) integral computer - based system (ICS).

9.13.3. ICS should be based on modern microprocessor-based systems and computers with adequate set of peripherals for data acquisition, storage and output and it should have faci- lities for data transmission by telephone channels.

9.13.4. In case, when a zone has several ATEs, EAK of the zone center should be located at one of them and equipment of automated groups installed at other exchanges of the zone should interconnect with ZMC ICS at the level of data exchange in the form of data, transmitted by dedicated telephone channel.

9.13.5. Off-line equipment of ZMC Жыиф and выфож should be based on computer facilities consisting of equipment for data storage, output and transmission by communication channels.

9.13.6. Off-line integral equipment of automated toll network managenent system should perform round-the-clock operation in real time.

9.14. Network management centers should also provide monitoring for:

- network operation;
- Telephone network organization;
- traffic, damage of circuits.

9.15. Toll network management centers should receive data from primary network management centers. Interaction between management systems is provided for:

- organization of channel groups along telephone network routes;
- control of satellite communication channels to be used in different directions during twenty-four hours (according schedule or secondary telephone network record);
- control of circuit switching at ASN failure;
- transmission of required documentation to management centers.

9.16. Function of local telephone network management are assigned to O&M center. These functions should be implemented in accordance with CCITT Recommendation Q.506.

9.16.1 Management of Subscriber Line Connection.

O&M operator should have the following possibilities:

- enter, change or eliminate additional services provided by the right of subscriber;
- form a new subscriber line or group of subscriber lines;
- add one or more subscriber lines to a group;
- switch-off one more subscriber lines;
- inquire for the list of subscriber lines with specified characteristics;
- search free telephone and hardware numbers;
- inquire for the list of installed telephone or hardware numbers.

9.16.2 Management of Equipment State and Usage.

9.16.2.1 Directives for trunk group management should allow:

- group formation;
- group elimination;
- group characteristic modification (signalling type, thresholds of electrical characteristics during tests, ets).
- adding or elimination of a line in the group;
- printing out a group characteristics and list of its lines;
- printing out the name of a group to which belongs the line with specified hardware number.

9.16.2.2 For the purpose of PCM paths management the following directives should be provided for АТСЭ:

- PCM path announcement (specified switching network input and path type matching);
- PCM path elimination;

PCM path switching from one network input to another.

9.16.3 Management of Call Handling Data.

Call handling data management should provode:

- modification of data used for charging;
- route formation (for outgoing calls);
- route elimination;
- bypass list modification;
- modification out specified route characteristics;
- change of restrictions for calls incoming to direct route or bypass (applied to eliminate network congestions).

9.16.4. State Management of CO Control Computer system (CCS).

9.16.4.1. System management directives should allow:

- inquire of two CCS half-systems state;
- inquire of CCS half-systems state change;
- system's slow restart control;
- update class priorities allocation by standard CCS peripherals;
- control CCS magnetic tape carriers.

9.16.4.2. O&M Center operator should be allowed:

- to specify time integral and period of summarized hourly output;
- to control summerized hourly output storage into repository;
- to specify list of time measurements for dedicated groups, routes;
- to control time measurements and their storage into repository;
- to control visualization thresholds of time measurements;
- to control measurements, periodic and random errors calendar (in response to inguiries, the calendar records, haracteristics, initial function parameters of required work and time of start-up).

9.17 Local, intrazone and toll telephone networks management system should be computer-based.

Control and indication system should be primarely computerized.

Information required for toll telephone network management is originally transmitted by dedicated telegraph channels in the form of data with low bit rate and control commands are pre-developped by management centers stuff.

10. PRINCIPLES OF CALL CONTROL

10.1 In Automatic switched national telephone network telephone circuits and lines switched mode is used.

10.2 Call control system is designed for distribution of calls over circuits and lines of the network in accordance with recommended handling system taking into account commands from network management centers.

Generally, static controlling principle, providing prearranged ordered of routs selection, is recommended for the second stage of development.

10.3 Call set up in toll and intrazone networks is controlled portion by portion, i.e, at every exchange or tandem, where the call is processed, digits of a toll (zone) number are analysed and one of possible routes to the exchange of destination is selected.

A toll call set up over alternative routes is performed through a single ATE both of incoming and outgoing zones and no more than two tandems of the same class.

10.3.1 The call controlling system of a toll network should provide calls distribution:

at outgoing ATE - by one of 5 possible routes in the following order: over one direct route to the exchange of destination and over two alternative routes to ASNII and ASNI of the territory of destination and by two LSRs to its own and adjacent ASN beginning with optimum LSR;

at outgoing ASNI by two possible routes: over LSR to own and adjacent ASNI of the exchange of destination beginning with optimum LSR;

at outgoing ASNII - by 3 possible routes in the following order: over two by-passes to ASNII and ASNI of the territory of destination and over LSR to own ASNI;

at incoming ASNI or ASNII -over LSR to the exchange of destination.

Note: When LSR channel group is divided into two sub-groups (microwave, cable two frequency of high efficiency, one frequency, CCS -for high quality) high usage sub-group should be primary selected and the sub-group of high quality afterwards.

10.3.2. The system for call set up control in intrazone network having alternative routs (with several ATEs available within the zone) should provide the following call distribution:

at outgoing ATE - by two possible routes in the following order:

over direct route to local network of distination,

over LSR to other ATE of the zone,

at incoming ATE-by LSR to local network of destination.

10.3.3. At exchanges and tandems route selection is performed in the following way:

- in outgoing terminal or transit toll communication - by one,two,three or primary five

digits of a toll number;

- in incoming toll communication - by primary five or six digits of a toll number;

- in zone communication - by intrazone routing digit and primary two or three digits of a zone number;

- in outgoing international communication-by routing digits of output to international network ("10", "15","19") or by a toll code of a gateway;

- in communication with service exchanges -by primary five digits (toll communication) or primary three digits (intrazone communication);

- in subscriber -to-ATE/OTL services communication -by two-digit number of the services.

Note: In AMTC-1,2,3-route selection is performed for outgoing communication by primary three digits of a toll number;

in AMTC-2,3 incoming communication- by reduced zone code ("1") and primary two, three digits of a zone number.

10.3.4. Information received and transmitted by exchanges and tandems of QE,E-types for call controlling in toll, intrazone and international communication is listed in Tables 10.1 and 10.2.

10.3.5. Call handling priorities at semi-electronic and electronic systems ASN and ATE (TTE) are listed in Tables 10.3 and 10.4.

10.4. Call set up controlling in local telephone networks could be performed as follows:

- by portions, when the network exchanges and tandems are stand-alone controlled so as every exchange or tandem processing a call analyses received digits of a subscriber number and selects a possible route to the exchange of destination;

- by centralised control when possible route selection based on received information about calling and called slave exchanges (sub-exchanges) is performed by master controlling exchange;

- by combined control, when set up of a call involves more than one master controlling exchanges or slave, master and stand alone controlled exchanges.

10.4.1. If outgoing exchange is a step-by-step one the call is set up at every portion in accordance with respective number of digits dialled by subscriber.

10.4.2. When a calling exchange is based on crossbar, semi-electronic or electronic equipment, the call is set up after full number dialling.

Note: UTNs based on mixed switching equipment (SS, CB QE, E exchanges start transmission of information about telephone number from calling QE, E CO after reception of adequate number of digits required for identification of SS CO number.

10.4.3. In networks without alternative routs, any call has only one route and every exchange or tandem processing a call selects the part of this route exclusively by respective digits of the subscriber number. When bypasses or route selection are available static control is used.

10.4.4. Release (disconnection) system.

10.4.4.1. In communication within UTN or RTN and between UTN and RTN, disconnection is provided with one-party release, that is, all equipment involved in connection should be cleared after release of either party. Moreover, UTN should provide possibility of malicious calls detection with ANI equipment.

Note: After release of the called subscriber transition to pre-answer mode of called subscriber speech paths is allowed with transmission of BUSY tone to the calling subscriber.

10.4.4.2. In urban exchanges having no ANI equipment or some other equipment for malicious calls detection possibility should be provided for transition to operation with the call holding before the called subscriber release (called and calling subscriber release system) by software or bridges in terminal calling equipment.

10.4.4.3. In pre-answer mode forced speech path equipment release from terminal calling exchange should be provided. Holding time of the forced release should be about 10-20 minutes with possibility of manual or program switch off.

10.4.4.4. In communication from ATE over TTL speech path equipment release should be performed only by signal from ATE and provided at any call stage.

10.4.4.5. UTN speech path equipment should provide simultaneous operation with equipment operating by either one-part release system or with equipment holding prior to the called subscriber answer.

The same requirement applies to ATE equipment interconnected with UTN by OTL.

10.4.4.6. In communication by OTL towards ATE CO speech path equipment is cleared either by system adopted for local communication equipment or by one-part release system.

10.4.4.7. In local communication, after subscriber release, subscriber line should disconnect independently from the second party involved in the call.

10.5. Further on, the network may use dynamic control that selects optimum distribution scheme for traffic flows in different network states.

Integral dynamic control method may be used for total network and different control methods - for particular network portions (local, intrazone, toll networks).

Dynamic control of traffic flows would be introduced together with implementation of software controlled exchanges and nodes and CCS signalling system.

Table 10.1 Information Received by ATE, ASN (TTE) of the QE,E type

Calling exchange, node	Number of received information	Information	Notes
1	2	3	4
CO (node) CB, SS with ANI	1	CsNsABCавх5 CsNsABC0авх4 CsNsABC00авх3	
	2	CsNs2авх5	
	3	CsNs10№ МН	not transmitted from long-distance pay-phones
	4	CsNs19L	
	5	CsNs11÷14	
	6	CsNsABC8x	
	7	CsNs16	
	8	CsNs17	
CO (node) QE, E	9	ABCавх5CsNsEd ABC0авх4 CsNsEd ABC00авх$_3$ CsNsEd	
	10	2авх5CsNsEd	
	11	10Nint CsNsEd	
	12	19LCsNsEd	
	13	11÷14 CsNsEd	
	14	ABC8x CsNsEd	
	15	16 CsNsEd	
	16	17 CsNsEd	
CO (node) CB SS with the own number di aling	17	ABCавх5Ns ABC0авх4Ns ABC00авх3Ns	
	18	2авх5Ns	
ATE QE,E of other zones; QE,E ASN	19	CcSesABCавх5Ed CcSesABCавх4Ed CcSesABCавх3Ed	
	20	CcSesABC0x1xx(x)Ed	
	21	CcSesABC8xEd	
	22	CcCэ10NintEd	
	23	CcSes19LEd	
	24	CcSes15CcoL81 Ed CcSes15CcoL82 Ed CcSes15CcoL83xxx Ed	
	25	CcSes44x Ed	
	26	CcSesABC89 Ed	

1	2	3	4
AMTC-5,6 of other zones	27	CcABCавх5Ed CcABCавх4Ed CcABCавх3Ed	Operation over channels with one-frequency signalling
	28	CcABC0x1xx(x) Ed	
	29	CcABC8xEd	
	30	Cc10NintEd	
	31	Cc19LEd	
	32	Cc15CcoL81Ed Cc15CcoL82 Ed Cc15Cco83xxx Ed	
	33	Cc44xEd	
	34	CcABC89Ed	
AMTC-2,3,5,6 of other zones	35	ABC - авх5 ABC - авх4 ABC - авх3	Operation over channels with two-frequency signalling
	36	I - авх5	
	37	ABC - 0x1xx(x)	
	338	I - 0x1xx(x)	
	39	ABC - 8x	
	40	I - 8x	
	41	ABC* - 10 Nint	
	42	ABC* - 19L	
	43	ABC* - 15CcoL81 Ed ABC* - 15CcoL82 Ed ABC* - 15CcoL83xxxEd	
	44	44x	
QE,E ATE of own zone	45	CcSes2авх5Ed	
	46	CcSes20x1xxxEd	
	47	CcSes28xEd	
	48	CcSes44x Ed	
	49	CcSes289Ed	
AMTC-5, 6 of own zone	50	Cc2авх5Ed	Operation over channels with one-frequency signalling
	51	Cc20x1xxxEd	
	52	Cc28xEd	
	53	Cc44xEd	
	54	Cc289Ed	
AMTC-5, 6 of own zone	55	I - авх5	Operation over channels with two-frequency signalling
	56	I - 0x1xxx	
	57	I - 8x	
	58	44x	
	59	I - 89	
AMTC-2, 3 of own zone	60	вх5	
	61	44x	

1	2	3	4
operator position ATE district center	62 63 64 65 66 67	CcABCавх5Ed CcABCавх4Ed CcABCавх3Ed CcABC0x1xx(x)Ed CcABC8xEd Cc2aвх5Ed Cc20x1xxxEd Cc28xEd	Channels from district center one-frequency signalling
district center operator position	68 69 70 71 72 73	ABC - авх5 ABC - авх4 ABC - авх3 ABC - 01xx(x) ABC - 8x I - авх5 I - 0x1xxx I - 8x	Channels from district center two-frequency signalling
operator position of international service	74 75 76 77 78 79 80	CcABCавх5Ed CcABCавх4 Ed CcABCавх3 Ed CcABC0x1x(x) Ed Cc2aвх5 Ed Cc20x1xxx Ed Cc10NintEd Cc19L Ed Cc15CcoL81 Ed Cc15CcoL82 Ed Cc15CcoL83xxx Ed	
CO trunk of speci fied ATE (ASN)	81 82	ABC0x1xx(x) 20x1xx(x)	
ATE of crued ATE (ASN)	83 84 85 of QE,E,	CcSes44x Ed CcSesABC89Ed CcSes289 Ed	

Notes:

1. x3, x4, x5 are three-, four-, five digit local numbers respectively (x3=xxx, x4=xxx, x5=xxx).
2. Telephone priority information received-from ANI is converted by ATE as follows:

Cs	Cc
1,2,3,4,5,6,7,8 -	13
4	11

For Cs 3:9, output to toll and intrazone networks is forbidden.

3. Calls arriving to the exchange without priority information (from AMTC-1,2,3, operator position) are assigned Cc14 - " non-priority semi-automatic call".

Table 10.2 Information Transmitted from ATE and ASN of QE, E type

Called exchange, node	Information	Numbers of Information Received from Calling Exchange, Node (Table 10.1)	Notes
1	2	3	4
CO, node CB, SS	авх5 вх5 х5	2, 10, 18, 19, 27, 36, 45, 50, 55, 60, 65, 71,76	
CO, node QE, E	авх5Сс вх5 Сс х5 Сс		
QE, E ATE of other zones QE, E ASN	CcSesABCавх5Ed CcSesABCавх4Ed CcSesABCавх3Ed	1, 9, 17, 19, 27, 35, 62, 68, 74	
	CcSesABC0x1xx(x)Ed	20, 28, 37, 63, 69, 75, 81	
	CcSesABC8xEd	6, 14, 21, 29, 39, 64, 70	
	CcSes10NintEd	3, 11, 22, 30, 41, 78	
	CcSes19LEd	4, 12, 23, 31, 42, 79	
	CcSes15CcoL81Ed CcSes15CcoL82Ed CcSes15CcoL83xxxEd CcSes44xEd	24, 32, 43, 80 83	
AMTC-5,6 (TTE) of other zones	CcABCавх5Ed CcABCавх4Ed CcABCавх3Ed	1, 9, 17, 19, 27, 35, 62, 68, 74	Operation over channels with one-frequency signalling
	CcABC0x1xx(x)Ed	20, 28, 37, 63, 69, 75, 81	
AMTC-5,6	CcABC8xEd Cc10NintEd Cc19LEd CcSes15CcoL81Ed CcSes15CcoL82Ed CcSes15CcoL83xxxEd Cc44xEd CcABC89Ed	6, 14, 21, 29, 39, 64, 70 3, 11, 22, 30, 41, 78 4, 12, 23, 31, 42, 79 24, 32, 43, 80 83 26, 34, 84	Operation over channels with one-frequency signalling
AMTC-2,3,5,6 of other zones	I - авх5 I - авх4 I - авх3 I - 0x1xx(x) 44x	1, 9, 17, 19, 27, 35, 62, 68, 74 20, 28, 37, 63, 69, 75, 81 83	Operation over channels with two-frequency signalling

1	2	3	4
	I - 8x I - 89	6, 14, 21, 29, 39, 64, 70 26, 34, 84	towards AMTC-5 towards AMTC-5
district automatic tandem	I - вх5 I - х5 авТI - х5 авТI - х4 авТI - х3	1, 9, 17, 19, 27, 35, 62, 68	
territory automatic tandem	mnT1 - вх5 mnT1 - х5 mnТавТ1 - вх5 mnТавТ1 - х5	1, 9, 17, 19, 27, 35, 62, 68 64	through territorial ASN towards district automatic tandem
territory auto-matic tandem	mnТавТ1 - х4 mnТавТ1 - х3	1, 9, 17, 19, 27, 35, 62, 68	through territorial automatic tandem towards district automatic tandem
	mnT1 - авх5 mnT1 - авх4 mnT1 - авх3	1, 9, 17, 19, 27, 35, 62, 68	through territorial automatic tandem towards ATE
QE,E ATE of the own zone	CcSes2авх5Ed	2, 10, 18, 19, 27, 36, 65, 71, 76	
	CcSes20x1xxxEd	20, 28, 38, 66, 72, 77, 82	
	CcSes28xEd	6, 14, 39, 67, 73	
	CcSes44xEd	83	
	CcSes289Ed	85	
AMTC-5,6 of own zone	Cc2авх5Ed	2, 10, 18, 19, 27, 36, 65, 71, 76	Operation over channels with one-frequency signalling
	Cc20x1xxxEd	20, 28, 38, 66, 72, 77, 82	
	Cc28xEd	6, 14, 39, 67, 73	
	Cc44xEd	83	
	Cc289Ed	85	
AMTC-5,6 of own zone	I - авх5	2, 10, 18, 19, 27, 36, 65, 71, 76	Operation over channels with one-frequency signalling
	I - 0x1xxx	20, 28, 38, 66, 72, 77, 82	
	I - 8x	6, 14, 39, 67, 73	
	44x	83	
	I - 89	85	
AMTC-2,3 of own zone	авх5	2, 10, 18, 19, 27, 36, 65, 71, 76	
	I - 0x1xx	20, 28, 38, 66, 72, 77, 82	
	44x	83	

1	2	3	4
Service CO of specified ATE, ASN QE, E	x1xxx	20, 28, 37, 38, 46, 51, 56, 66, 72	
International Telephone Exchange	Cc10№мнEd Cc19LEd Cc15KcL81, 82(83xxx)	3, 4, 11, 12, 22, 23, 24 30, 31, 3241, 42, 43, 78, 79, 80	

Notes:

1. mn-information for territorial automatic tandem stages control, the information is formed at specified ATE(ASN)

2. T-1-2s.time delay added to interdigit time at specified ATE (ASN).

Table 10.3 ASN Identification of Call Priorities

Input exchange	Priority	Output Exchange				
		TTE**(5,6), AMTC**-5,6	AMTC-5-10	AMTC**-7-10, ASN, ИАТСКЭ*	AMTC-1,2,3	operator position
1	2	3	4	5	6	7
TTE*(5,6)	Cc. in. Cp Cc out	11 12 13 14 II IY 11 12 13 14	13 14 IY 13 14	11 12 13 14 II IY 3 4 13 14	13 14 IY -	11 12 II -
AMTC**-5,6, 7,8,9,10	Cc. in. 	11 12 13 14 III IY 13 14 13 14	11 12 13 14 III IY 11 12 13 14	11 12 13 14 III IY 11 12 13 14	11 12 13 14 III IY -	 -
AMTC**-7-8,9,10, ASN, ИАТСКЭ*	Cc. in. 	1 2 3 4 11 12 13 14 I II III IY 11 12 11 12 13 14 13 14	11 12 13 14 III IY 11 12 13 14	1 2 3 4 11 12 13 14 I II III IY 1 2 3 4 11 12 13 14	11 12 13 14 III IY -	1 2 3 4 I II -
AMTC-1, 2,3 regional cen ter operator position	Cc. in. Cp Cc out	- IY 14	- IY 14	- IY 14	- IY -	 -
operator position	Cc. in. Cp Cc out	4(12) II 12	 - 	4(12) II 4	 - 	4(12) II -
regional center operator position with pushbutton	Cc. in. Cp Cc out	12 14 III IY 14 14	12 14 III IY 12 14	12 14 III IY 12 14	12 14 III IY - -	 -

Table 10.4 Identification of Call Priorities at Terminal and Terminal-Transit ATE= 7,8,9,10

Input Exchange	Priority								
		CB CO	CO		AMTC-5,6,7,8,9,10 TTE (5,6)	AMTC**-5,6, TTE**(5,6)	AMTC**-7-10, ASN, ИАТСКЭ*	AMTC-1,2,3	Operator position
			CB CS	E					
1	2	3	4	5	6	7	8	9	10
CB CO	Cs	4				4	4		4
	Cp	II	-	-	-	II	II	-	II
	Cc out	-				II	3		-
CO	Cs		4 1 2 5-8	4 1 2 5-8	4 1 2 5-8	4 1 2 5-8	4 1 2 5-8	4 1 2 5-8	
	Cp	-	III IY	III IY	III IY	III IY	III IY	III IY	-
	Cc out		-	14 14	11 13	13 13	11 13	-	
AMTC-5,6,	Cc. in.		11 12 13 14	11 12 13 14	11 12 13 14	11 12 13 14	11 12 13 14	11 12 13 14	
7, 8,9,10,	Cp	-	III IY	III IY	III IY	III IY	III IY	III IY	-
TTE (5,6)	Cc out		-	14 15 14 15	11 12 13 14	13 14 13 14	11 12 13 14	-	
AMTC**-5,6,	Cc. in.	11 12	13 14	13 14	13 14	11 12 13 14	11 12 13 14	11 12 13 14	11 12
TTE**(5,6)	Cp	II	IY	IY	IY	II IY	II IY	III Y	II
	Cc out	-	-	14 15	13 14	11 12 13 14	3 4 - 13 14	-	-
AMTC**-	Cc. in.	1 2 3 4	11 12 13 14	11 12 13 14	11 12 13 14	1 2 3 4 11 12 13 14	1 2 3 4 11 12 13 14		1 2 3 4
-7-10, ASN,	Cp	I II	III IY	III IY	III IY	I II III IY	I II III IY	III IY	I II
ИАТСКЭ	Cc out	-	-	14 15 14 15	11 12 13 14	13 14 13 14	1 2 3 4 11 12 13 14	-	-
AMTC-1-3, district center operator position	Cc. in.		-	-	-	-	-	-	
	Kp	-	IY	IY	IY	IY	IY	IY	-
regional center operator position	Cc out	-	-	15	14	14	14	-	
regional center operator position with pus hbutton dialer	Cc. in.		12 14 I	12 14	12 14	12 14	12 14	12	
	Kp	-	II IY	III IY	III IY	III IY	III IY	III IY	-
	Cc out		-	15 15	12 14	14 14	12 14	-	
operator position	Cc. in.	4(12)				4(12)	4(12)		4(12)
	Kp	II	-	-	-	II	II	-	II
	Cc out	-				12	4		-

Note to tables 10.3 and 10.4:

Calls advancing through more than two nodes of the same class should not be considered. (See &10.3)

Conventional Signs for Tables 10.3 and 10.4

* Exchanges of the system closen by service;

** PSTN exchanges and nodes processing calls from the system chosen by service.

11. SERVICE QUALITY RATES FOR CALL HANLDING

11.1. The following service Quality rates are reccomended to calculate quantity of local and intrazone netw

orks devices, lines, circuits and operator positions for subscribers attendance. The same rates are applicuble to operating conditions of a network and its spans with standard traffic per average busy hour for 30 most heavy traffic days of a year (CCITT Recomendation E.500). The rates specify as well maximum possible lossa related to devices and circuits non-available due to internal blockings in switching equipment. At bypasses the same rates are recommended for calculation of circuits (lines) quantity per LSR span.

Note. To provide adequate call handing quality in conditions of possible individual spans congestion maximum tolerable unitload of devices (circuit, lines) (no more than 0.8 Erl. in standard conditions) should be observed simultaneously with the rates specified. Perspective rates for call handling quality under heavy traffic conditions, determined as traffic per average busy hour for 5 most heavy traffic days of a year, are expected in accordance with CCITT Recomendations.

11.1.1. Call handling quality rates for UTNs are shown in Tables.

11.1. and 11.2. The same rates apply to urban portions of hybrid telefone networks.

Table 11.1. Call handling quality Rates for Urban Step-by-step and Crossbar Exchanges and Nodes

Portion of a call	Loss rates (in busy hours)	
	step-by-step exchanges	crossbar exchanges
1.АК-1 ГИ (group selector).	0,005	0,007
2.Between adjacent selection stages inputs in subscriber local communication	0,005 (0,007)*	0,005
3.Between adjacent selection stages inputs in outgoing toll communication	0,001	0,001
4.Between adjacent selection stages inputs during output to emergency services	0,001 (0,002)*	0,001
5.Between adjacent selection stages inputs during output to non-emergency services	0,010	0,010
6.АИ stage communication		0,002

* Allowed only for a single portion of a call in communication with crossbar system equipment.

Table 11.2. Call Handling Quality Rates in SPC UTN Exchanges and Nodes

Portion of a call	Loss Rates (in busy hours)
1.Between adjacent exchanges nodes inputs	0,005
2.From subscriber input of calling reference exchange or sub-exchange with centralized control:	
towards other exchanges towards emergency services towards non-emegency services	0,005 0,001 0,010
3.From sub-exchange subscriber input with decentralized control up to the reference exchange input	0,002
4.From the reference exchange input or subexchange of any type included into it:	
in local incoming communication in toll incoming communication	0,010 0,003

11.1.2. Service quality rates are listed in Tables 11.3 and 11.4 The same rates apply to rural spans of hybrid networks.

Note. If necessary, implementations of rates, listed in Tables 11.3. and 11.4. may be provided by restricting external communication of some TO and TrO subscribers. If implementation of rates requires additional transmission system or cable to be layed, the rates are allowed to be 1,5 times higher. If actual number of channels available exceeds required number of channels groups capacity is recommended to be increased to provide 1,5-2 times reducing of the rates.

Table 11.3. Service Quality Rates for Call Handling in Rural Crossbar Exchanges

Portion of a call	Loss rate in busy hours for Exchanges of the type	
	АТСК-50/200	АТСК, АТСКУ, АТСК-100/2000
1	2	3
1. АК – ШК	0.020	-
2. АК – register	0.004	-
3. АК – 1 group selector	-	0.007
4.Between adjacent selection stages inputs:		
output to emergency services	-	0.001
output to non-emergency services	-	0.010
other types of local communication	-	0.005
toll incoming communication	-	0.001
5.From outputs of the stage including interoffice trunks (circuit) towards any route of interoffice communication:		
TO capacity up to 200 lines;	0,300	-
TO capacity up to 900 lines;	-	0.020
TO capacity above 900 lines	-	0.010
6.Registers selection stage at incoming communication	0.004	0.002*
7.3к stage at incoming communication	-	0.002

* For registers connected to lines with out backward hold signal transmission, the loss rate is not specified; in this case, standard register selection scheme-5 registers for 20 sets of line equipment is used.

Table 11.4. Service Quality Rates for Call Handling SPC Rural Exchanges.

Portion of a call	Loss rate in busy hours)
1.Intraoffice communication	0,20
2.From БСЛ (БВЛ) output up to the called subscriber line (incoming communication)	0,005
3.From CO calling output towards other CO(outgoing or transit communication)	0,010 - 0,030 *
4.From CO calling output towards communication within a single community:	
to emergency services	0,001
to non-emergency services	0,010
to PABX in local communication	0,005
to PABX in toll communication	0,001

* Depends on TO capacity in accordance with item 5 of Table 11.3.

11.1.3. Service quality rates in intrazone network spans are listed in Table 11.5.

Table 11.5. Service Quality Rates for Intrazone Network Spans

Portion or stage of a call	Loss rate at busy hours		
	A town with ATE	Rural district	Towns of a region
1. Output to ATE over direct OTL group	0.005 (0.007)	0.010 (0.012)	0.010 (0.012)
2. Output to СКИ	0.003 (0.005)	0.003 (0.005)	0.003 (0.005)
3. Transit in СКИ	0.002	0.010	0.010
4. ATE-TITT	0.002	-	0.010
5. ATE-CO (without TITT)	0.002	-	0.010
6. ATE-CO (SSN)	-	0.010	-

Note. Values given in brackets apply to connection with Intermediate register. At LSR ATE-ATE and ZTN-ATE portions of intrazone network 0,01 loss rate is recommended.

11.1.4. Systems included into system telephone networks and providing inquiry, recording, emergency and additional services can handle calls with losses or limited waiting time.

Quantity of equipment and operators in any system of the type should be calculated so that the share of traffic created by calls on waiting shouldn't exceed 3% of the total traffic handled by the system; moreover,if the handled traffic should increases by 20% versus nominal, intencity of call arivals to calling system should not increase more than 40% (taking into account repeated calls flow intensity).

11.2. For calculation of devices and channels quantity in a toll telephone network the following service quality rates are recommended.

11.2.1. Service quality for toll channels is determined by loss probability for a single LSR portion that equals 0,01.

11.2.2. Different priority-depended methods of call handling are used in PSTN.

11.2.2.1. Calls with priority 1 are handled by limited waiting system with absolute priority of handling and queing. The system recommended provides priority 1 calls handling without loss and waiting at 20% increase of traffic.

11.2.2.2. Both 2 and 3 priority calls are handled by limited waiting system with relative

priority. Queing of waiting calls is done in accordance with respective priority.

The system recommended provides both 2 and 3 priorities handling with loss probability less than 0.01 at 20% increase of traffic.

Herein, average waiting time of waiting or any other call is t0<5s, t<1s.

11.2.2.3. 4 priority calls are handled by system with osses. Loss rate probability per portion is LSR-0,01.

11.2.3. Quality service rates for ATE and ASN are determined by quality service of other devices. Service quality rates recommended for devices of different types are described in relevant methodics. Loss probability both in ATE and ASN is determined by loss rate of these exchanges switching networks. Loss rate for switching networks AMTC-5,6,7; QE ASN and AMTC-2,3 is 10, up to 2,223 and 0,007, respectively.

11.3. Calculated cumulative loss from subscriber to subscriber due to busy lines, channels and interfaces should not exceed:

in UTN subscribers communication -0,03 (in communication
with suburbs and PABX subscribers-0,04);
in RTN subscibers communication-0,12;
in intrazone communication-0,03-0,13;
in toll communication-0,1 (for UTN subscribers).

11.4. A quota of uncompleted calls due to busy subscriber lines and non-answeres of called subscribers should be as follows:

for busy subscriber lines-0,2-0,3;
for non-answers of called subscribers 0,12-0,15.

The quota of calls uncompleted due to subscribers and technical mistakes should not exceed:

for local communication 0,05-0,1;
for toll and intrazone communications 0,10-0,15.
Therefore, the quota of completed calls is:
for local communication 0,5-0,6 (or number of calls per
conversation is 1,6-2);
for intrazone communication 0,4-0,5 (number of calls is 2-2,5);
for toll communication 0,4 (for UTN subscribers, number of calls is 2,5);

11.7 Time of Connection

Time of connection is determined by duration of time interval between the moments of dialling finish and starting of a ringing tone or busy signal.

Time of connection consists of technical time (time of CO, ATE and ASN operation) plus time of waiting for devices or channels to be released, calculated for any call at respective devices and network sections.

11.7.1. Connection time in local networks designed for step-by-step exchanges actually equals to zero since the call completion process is finished simultaneously with the end of dialling. For crossbar exchanges in intrastation and interstation communications with same type exchanges, connection time is 2-2,5s depending both on number of digits in the network numbering and quantity of selection stages. During call set up between cross-bar and step-by-step exchanges average time of connection is 0,5s. For SPC exchanges time of connection is near 0,5 s within the exchange and about 3s within urban network. For rural crossbar exchanges of the type ATCK-50/200 and ATCK -50/200M time of connection is about 0,5 s.

For ATCK-100/200 with skeleton connection and single group selection stage time of connection is 2s. Average time of connection between RTN subscribers via three crossbar system transit nodes (one CO and two TE) is 6s.

Note. Time of call set up includes handling delays due to waiting in control devices of exchanges with centralized control. Rates for such delay characteristics are determined in methodics or instruc tions on equipment volume calculations for design of exchanges of particular type.

11.7.2. In toll networks average time of call set up for terminal communication of exchanges of different types is 4 - 17s. In multifrequency transmission of numeral data time of connection depends on number of transits and should not exceed 4 - 11s for every link. Average time of connection for waiting calls in communication via 4 transits is 30s.

11.8. Quality rates for calculations of operator positions (inquiry, recording, toll).

$$P(>t)<=0,1$$ where

t - is tolerable time for operator answer (t=15s).

12. PRINCIPLES OF INTERCONNECTION WITH OTHER TELEPHONE COMMUNICATION SYSTEMS

12.1. Principles of inter connection with PTT exchanges and networks.

12.1.1. PTT telephone networks having access to the national network should meet terms and conditions for UATS facilities and circuits and ability to connect to PSTN in accordance with instructions set forth in "Common Requirements for PTT Networks Compliance with National UATS Networks".

12.1.2. PTT exchanges interconnection with national network should be made at local telephone networks level.

PABX can could be used as PTT exchanges in local networks.

12.1.2.1. Automatic and manual PBX should be connected to UTN via CO or instead of CO at RTN - to TrO or CO and also vto TOs that have direct connection to CO, should have more than one route and provide transit (e.g., АТСК type-100/2000, АТСКЭ-С, ИАТСКЭ 1.)

For PBX connection with UTN one-way trunk groups (outgoing and incoming) are used and for connection with RTN - are used both one - and two - way trunk groups.

PABX with capacity exceeding 6.000 lines - could be connected as instead of CO and UTN.

District exchanges of persprctive systems may dedicate groups of customer business stations provided with all services foreseen for such customers.

With sufficient PBX number within one node area at CO or ITT of UTN, a node of PTT exchanges based on UTN typical node equipment should be organised for outgoing local and toll communication with PBX.

Outgoing local and toll communication of PBX included into the node of departmental telephone exchanges node should be performed via CO.

12.1.2.2. Access to the national network can be restricted for the part of PBX subscribers.

12.1.2.3. Local telephone networks access to PBX subscribers should be made to: subscriber stations with numbering within the national network numbering - by dialling complete local network numbering; other subscriibers - with attendance of PBX operator caled by complete number dialling.

12.1.2.4. Incoming connections to PBX subscribers having access to PSTN should be automatic.

The use of PABX with manually handled incoming connections and also organisation of connections incoming to PABX via operator or secretary boards are allowed as exceptions.

12.1.2.5. The numbering of PABX subscribers with restricted access to PSTN networks is not included into UTN and RTN numberings. Interconnections within PABX have reduced dialling. Number of digits depends on PABX capacity.

Every PABX subscriber with output to local PSTN is assigned a local directory number containing corresponing number of digits. Required number of numbering groups consisting of hunderds, thousands and ten thousands is dedicated depending on local network numbering for PABX subscribers.

PABX subscriber numbering is agreed with local network adminisrtration.

A serial number (or some numbers for every trunk group of an exchange) depending on the trunk group circuit diagram for local PSTN exchange are dedicated out of total local PSTN netwrok numbering for PABX with manual handling of incoming connections.

Local PSTN network subscribers are called by PABX subscribers by ialling on access code digit for the national network (digit "9" is recommended) followed by local telephone number of required subscriber after listening or without listening to the central office dial tone.

Some PABX subscribers may have access to PSTN without access code dialled if PABX equipment provides such opportunity.

12.1.2.6. Typical PABX connection with ATE is made via local PSTN network. Some PABX are allowed by USSR Ministry of Communications to communicate with ATE by self-contained OTL and TTL groups (exercising CO rights).

12.1.2.7. PABX with output to PSTN should be equipped with ANI equipment to perform automatic toll and zone communications with charged inquiry and recording services.

If there is no such equipment at the PABX connected to a CO equipped with ANI, automatic toll (intrazone) communication and communication with charged inquiry and recording services is provided only if the CO is capable to iden- tify trunk number from PABX and present bills to PABX owner.

International calls of PABX subscribers are payed by PABX owne.

If ANI equipment is not available at the reference exchange, toll (intrazone) communication and communication with charged and recording services are allowed to PABX subscribers with their personal number dialling.

12.1.2.8. A set of line, control and informational signals, their transmission methods and parameters at PABX output to national local, intrazone and toll networks should comply with the set of transmission methods and signal parameters situted by the corresponding sections of PSTN SR.

PBX should be equip- ped with special interface facilities.

12.1.2.9. PABX switching equipment should be designed to provide standard service quality (Section II), for PSTN subscribers calling PABX subscribers having access to PSTN.

12.1.2.10. PBX subscribers access to PSTN should comply with attenuation plan for PSTN subscribers. AT the span from PBX subscriber to the reference exchange of a local PSTN attenuation at of 800 Hz frequency should not exceed 4.5 dB, at the span from PBX subscriber to PSTN ATE it should be no more than 9.5 dB.

For RTN span from PBX subscriiber to the reference exchange attenuation should not exceed 4.5 dB or 9.5 dB in cuse of four-wire transit at CO; and trunks of all spans from the reference exchange up to ATE and transmission systems use.

12.1.3. Interconnection between dedicated private telephone networks and national network should be performed at the level of local, intrazone and toll networks.

12.1.3.1. At local networks level dedicated private telephone networks should interconnect with PSTN via CO and nodes at UTN and via CO at RTN. Communication should be attended by an operator. Operator transfer boards should be connected to:

subscriber line units or group stage of the exchange for outgoing communication;

subscriber line units of the exchange (continuous hunting) or to private telephone communication nodes for incoming communication.

Communication between dedicated private networks and local newtorks could be automatic if subscriber numbers of private networks are within respective PSTN local network numbering. Communication with the called private exchange is performed via PSTN.

12.1.3.2. At intrazone and toll telephone networks levels dedicated private telephone networks could interconnect with PSTN by two methods:

Methods 1. Private networks are directly connected to ATE zones and exercise the rights of a local telephone network. Every type of OTL and TTL should be connected with respective matching equipment installed at private networks exchanges. Numbering system allocated one number in every zone for private network - ABC84, where: ABC is the toll code of a zone where private network is situated; 84 is two-digit number of private network. Should a zone have several private networks requiring direct connection to ATE, these should be connected to a special node coupled with ATE (the node number is ABC84).

Set up of PSTN subscriber calls to private network subscribers should be provided via private network operator.

Backward direction calls can be set up automaticaly or via an operator.

Methods 2. Private networks are connected to ATE and ASN with special equipment and exercise rights of zone telephone networks. Toll code ABC is provided for output to such a network (no more than 10 codes can be allocated).

Incoming and outgoing connections should be set up via PTT network operator.

Outgoing connections of private network subscribers to PSTN subscribers should be set up over private circuits up to ATE existing in the called subscriber zone. These calls should not be charged.

Outgoing connections from PSTN subscribers should be set over national network up to the private network operator nearest to a calling subscriber. To access the operator PSTN

subscriber should dial ABC8X, where ABC is a toll code dedicated for PTT network, 8X is two-digit number of private network (there could be 10 numbers).

Special interface equipment should be provided at PABX.

For private network subscribers communication with national network susbcribers possibility should be is provided for private network operator connection to the called subscriber engaged in a local call and local connections break in favour of toll ones during the called subscriber release.

To set up a toll call from national network subscriber connected to AMTC 5-10 types, to private network subscriber the calling subscriber dials 8-ABC8X, where ABC is toll code especially dedicated in the national network for output to privte network, 8X is two-digit number of the given private ATE.

To set up a toll call from the national network subscriber, connected with AMTC- 2,3 types, to private network subscriber, the calling susbscriber dials ten digit number.

12.1.4. Private exchanges and networks interconnection with PSTN should adhere to all requirements of this document.

12.2. Mobile Communication Principles

12.2.1. Mobile communication is designed for two-waytelephone communication between PSTN subscribers and subscribers of mobile objects (cars, trains, ships, buses, planes, etc.) and between mobile objects subscribers.

At the second stage of UATS implementation mobile radio should provide communication for car-travelling subscribers.

Business communication of mobile PSTN subscribers with their office dispatcher could be a basic type of communication, possibility of communication with stationary PSTN subscribers could be limited. Manual call set up is possible.

Mobile communication stations interconnecting with PSTN should be connected to local telephone networks via central dispatcher position as exercising susbcriber or PABX (100 extensions) rights. For mobile communication organization in UTN, "Altai" system is used, in RTN - "Kolos" system.

12.3. Principles of Interconnection with International Telephone Network.

12.3.1. Principles of international telephone network development.

According to the CCITT recommendations for international communication there automatic switching centers of three classes should be built : ASC1, ASC2, ASC3. Each of these centers is a terminal international gateway, Moreover ASC1 and ASC2 are the centers of automatic transit for international communication.

The whole globe is divided into switching zones - "telephone continents". On every "continent" there is an international telephone exchange of the ASC1 class. This gateway should support all types of international links (over satellites, transconti- nental cables).

Coverage of international exchange ASC1 is the switching area of ASC1.

There are international gateways of the second class, ASC2, and of the third class, ASC3, located in the ASC1 switching area. ASC2 coverage unites several countries.

Sometimes, ASC2 coverage may coincide with a single country territory or with a part of a country territory.

ASC3 coverage is typically limited to a single country territory.

Figure 12.1. shows the diagram for international network. According to the diagram international telephone gateways ASC1 should be interconnected by LSR circuit groups according to the "each with each " principle. ASC1 should be connected with ASC2 of its switching area by LSR circuit groups. Inter- national telephone gateway ASC2 should be connected with ASC1 and ASC3 of their area by LSR circuit groups.

Direct circuit groups of high quality or efficiency may be organised if there is sufficient traffic between any two CTs of different switching areas.

Maximum number of switched links providing international call is 14 (Recommendation E171).

Local exchange of a national network typically can connect with international network using 4 switched links, in some casesusing 5 slinks (Recommendation Q40).

The Globe is divided into nine zones A subscriber complete international number consists of an international country code and subscriber national number. Maximum number of digits in a complete international number should be up to 12 digits be (CCITT Recommendation IE 161). A country international code may contain from one to three digits. Numbers from 1 to 9 are used as its first digit.

International codes assignment for every numbering zone was made in accordance with telephone networks capacity and number of digits in national codes of countries included into this numbering zone. In accordance with the world numbering plan every zone has spare codes.

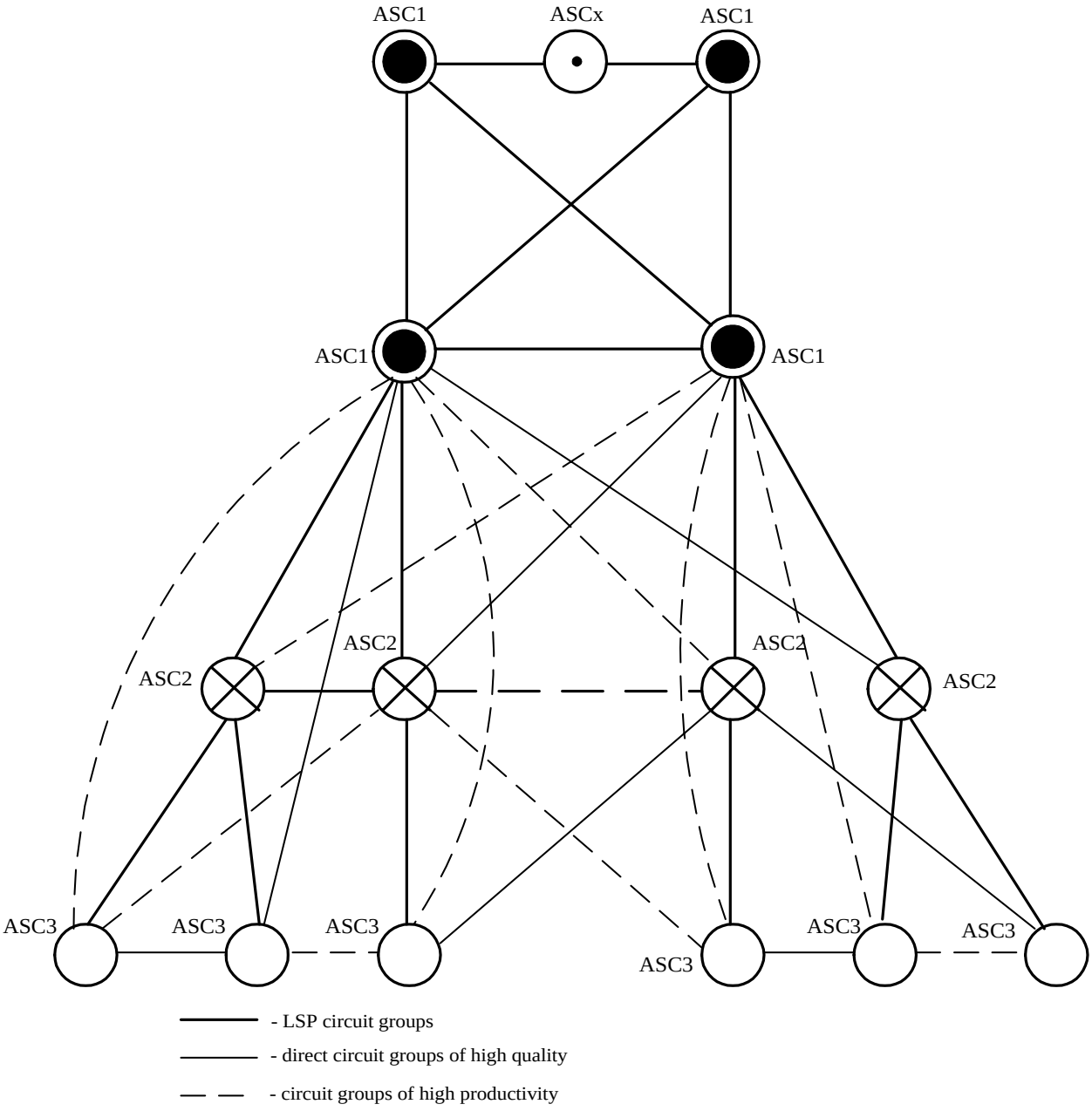


Fig. 12.1. Diagram for International Network Building

12.3.2. Principles of international Outgoing and Incoming Communication on the USSR Territory Considering CCITT Recommendations.

National Network is connected to the Whole international network via this country international gateways.

There is one international gateway ASC1 in Moscow, it is the center of Eastern Europe "continent".

The USSR territory belongs to numbering zone "7". Several international gateway, class ASC2 are installed installed on the national network of this country.

Every international ASC1 and ASC2 gateway would be a reference switch for a number of PSTN zones. Since there would be no ASC3 gateways in the USSR, the number of switched links up to a reference ASC2 gateway should be no more than 5 for the most pat of traffic, for non-significant part of traffic it is allowed to have up to 6 links.

Direct acess to ASC1 should have 6 and 7 switched sections for the first and second cases, respectively.

Communication between international gateway of the country should contain the following links:

TO-TE-CO-ATE-ASNII-ASNI-ASC2
RS-CO-OTLN (TITT) - ATE-ASNII-ASNI-ASC2

TO-TE-CO-ATE-ASNII-ASNI-ASNI-ASC1
RS-CO-OTLN (TITT) - ATE-ASNII-ASNI-ASNI-ASC1

Figure 12.2 Shows the diagram of international outgoing and incoming communication organization on the territory of this country.

Figure 12.2. Diagram of international outgoing and incoming communicatiom organization.

1. LSR circut groups of international network
2. circuit and trunk groups of international network.

Outgoing and incoming international network channels, outgoing and incoming toll network channels and, in some particular cases, outgoing and incoming links to the local network of the town, where ASC is situated, should be connected to ASC1 and ASC2.

Direct access to international network from ATE and ASN is not provided.

12.3.2.1. Automatic and semi-automatic communication with other countries of the world is performed via reference ATE of the calling subcriber zone, automatic switching nodes and further on via international network ASC.

In special cases, direct output to international network bypassing reference ATE could be organized for subscribers of the town where an international gateway is located.

Charging for calls is made at a reference ATE except calls from subscribers of the town where international gateways are situated. In this case charging accounting is made at this gateway.

To set up international semi-automatic communication at outgoing ATE of towns that have no international gateway, international services are organized in which operators set up international calls with attendance of their country ASC operator, with attendance of destination country ASC operator or directly the called to international network subscriber via a reference international gateway.

International gateway organizes international recording services for international calls from international network operators and subscribers of the town having an international gateway.

At international gateways with outgoing international comminication, calls are served by priority. Therefore, control signals transmitted to ASC should have telephone or call priority.

Notes:

1). Exchanges AMTC - 1,2,3 do not provide automatic outgoing international communication.

2). Exchanges AMTC - 2 with semi-automatic communication provides only access to ASC operators of this country.

3). Exchanges AMTC - 5,6 do not provide automatic outgoing communication to CT via ASN by LSR (IAR) with bifreguency signalling. Besides, exchanges AMTC-5,6 can act as ASN in communication with ASC providing that international number consists of less than 11 digits.

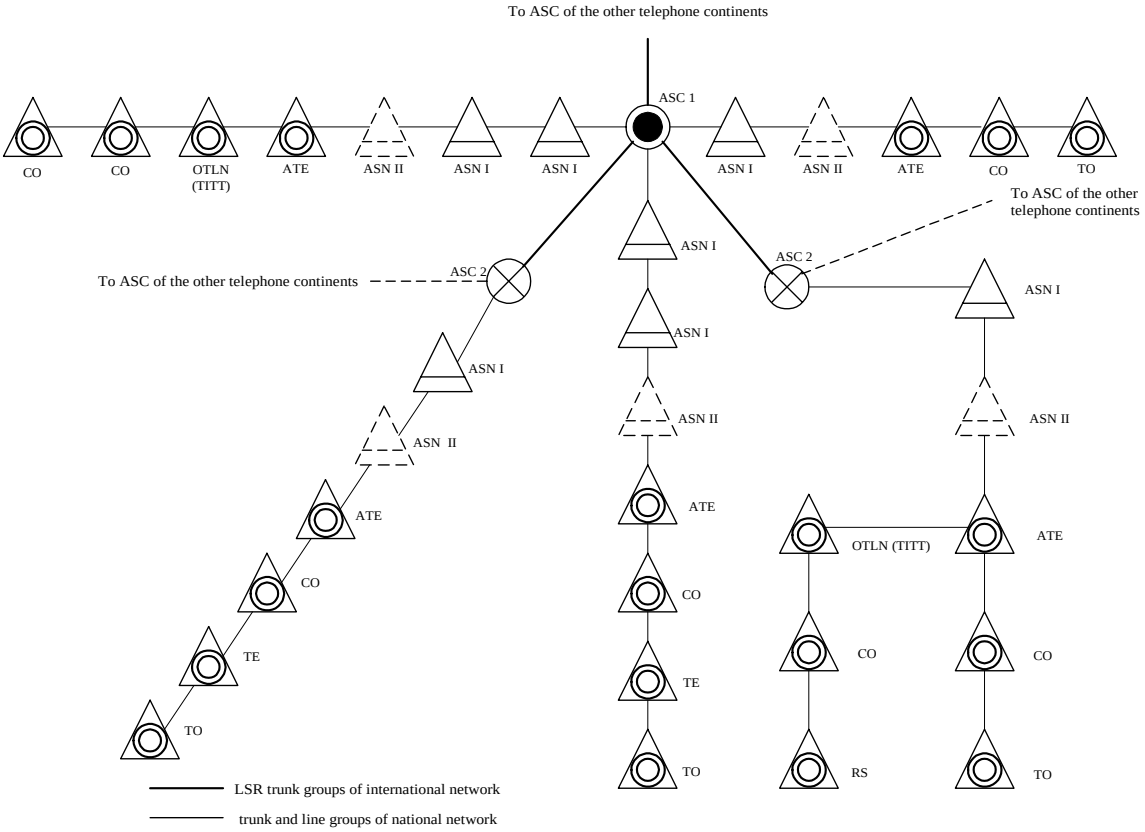


Figure. 12.2. Diagram of outgoing and incoming international communication organization

12.3.2.2. Incoming automatic and semi-automatic communication is provided by international netwotk up to a reference ASC and further on by national network up to the reference ATE of the called subscriber.

With incoming semi-automatic communication other countries operators get an output to national networks subscribers:

directly;

via ASC operator of this country that calls on a

subscriber directly or via ATE international service ope-

rator;

via ATE international service operator.

Figure 12.3 shows diagram of ATE's of different type interconnection with ASC1 directly or via ASN and a set of control signals transmitted over a toll network with outgoing international communication. Figure 12.3 Diagram of different ATEs interconnection with ASC1.

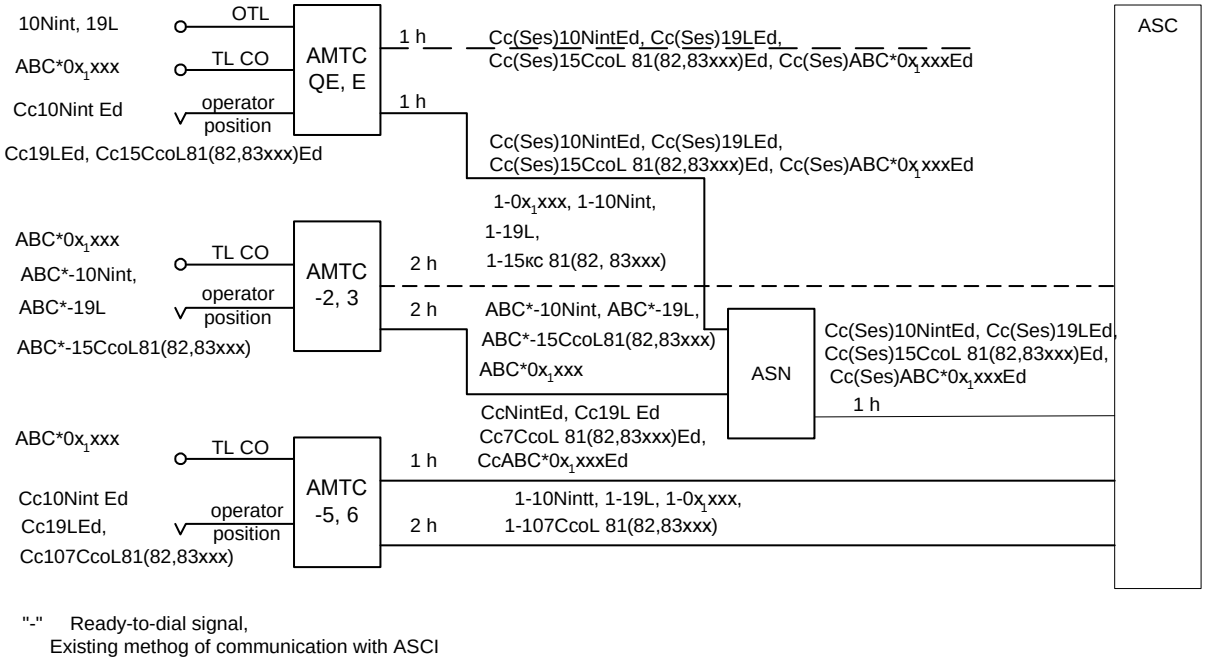


Figure 12.3 Diagram of different ATEs interconnection with ASC1

13. EQUIPMENT SYSTEM

13.1. The exchanges and nodes, installed in toll, zone and private telephone networks should comply with UATS specifications.

Main specifications are as follows:

13.1.1.Provision of high-priority calls.

13.1.2. Connections set up through alternative routes.

13.1.3. Use of zone numbering principle.

13.1.4. Use of one-frequency signalling system, implementing a multi-frequency method (common-channel signalling) for transmission control signals.

13.1.5. Selection of a direction by evaluating first five characters of a toll number which provides:

- an output to the required zone ATE, if there are several ATE in different cities of the called zone;
- an output by the ABC 81 code to ATE international service with the ABC 82 code to swithes and stations of the selected system to private networks etc.

13.1.6. Use of alternative routes of the zone network, if there are several ATEs in the zone:

13.1.7. Introduction of dinamic traffic control.

13.1.8. Use and neutralization of echo cancellers.

13.1.9. Use of error-corecting method, for the exchange and node maintenance.

13.2. Following exchanges can be used in the toll and zone telephone networks:

- AMTC-1M - step-by-step exchange, doesn't provide communications using zone principle. It can be operated as an automatic outgoing terminal exchange. It doesn't comply with UATS specifications.
- AMTC-2 - relay crossbar exchange. It can be used as a terminal switch. It is not fully compliant with UATS specifications.
- AMTC-3 - relay crossbar exchange. It is similar to AMTC-2.
- AMTC-5 - relay crossbar exchange ARM20, imported. It can be used as a transit-terminal switch. Fully compliant with UATS specifications.

- AMTC-6 - imported, mechanical-electronic exchange APE-13, which contains a crossbar switching network, multiprocessor control and special maintenance processor. It is analogous to AMTC-5.

- AMTC-7 - stored - program,- controlled semi-electronic exchange Metaconta 10 C. Imported.

It can be used as a terminal, transit terminal and transit switch. Fully compliant with the UATS specifications.

- AMTC-8 - centralized stored-program-controled semi electronic exchange " Kwartz"

It can be used as a terminal, transit-terminal and transit switch. Fully compliant with UATS specifications.

- AMTC-9 - electronic exchange under development (А,Б and following indexes designate a maximal capacity).

- AMTC-10 - electronic digital stored-program-controled exchange. It can be used as a terminal, transit-terminal and transit switch. Full compliant with UATS specifications.

The main features of AMTC-1M, AMTC-2,3 are given in the 13.1. a Table, and AMTC-5-8,10 in the 13.1.6. Table.

13.3. The software of semielectronic and electronic exchanges.

13.3.1. The software of semielectronic and electronic ATEs should have a modular-hierarchical architecture.

The modular-hierarchical method provides a design of software using different functional modules-systems, subsystems and procedures, which are implemented as independent program layers, depending on a module complexity.

The software should incorporate layers, which determine:

- a sequence of starting tasks.
- program operator sets and their execution sequences;
- instruction sequences which handle program operators at the physical level of computer, etc.

13.3.2. The software should support extension and modification of equipment used, introduction of new communications and services, fast identification and correction of errors found in the software, exchange protection from technicians incorrect use, software faults and equipment failures.

13.3.3. One should strictly follow the directions disclosed in the documenation while operating software.

13.4. To provide O&M of stored-program-controled exchange there should be software suport & development centres.

13.4.1. According to the exchange project, the software development centres (SDC) provide for AMTC-8 software and a required documentation, and installation of software at new exchanges.

13.4.2. Software maintenance centres (SMC) provide software maintenance for used ATEs.

The basic tasks of SMC are as follows:

- identification of errors in the software and their correction;
- development of modern software versions and their installation at semielectronic and electronic ATEs used and under development;
- training of ATE staff.

13.4.3.SDC contains computer resources, required for development and test of software tools.

13.4.4. SMC contains computer resources and test beds of ATE, required for error identification, new software versions test and development, and ATE staff training.

13.4.5. SMC for imported and domestic exchanges are based on different equipment. A SMC allows to maintain up to 30 exchanges.

13.4.6. A centralized software maintenance for programcontrolled, telephone exchanges in UTN and RTL is provided by operation programming centres (OPC). A OPC allows to maintain up to 100 exchanhes (should be defined more exactly during an operation).

13.4.7. The functional tasks of OPC are as follows:

- reception of program tools from SDC to be installed in each exchange.
- exchange and subscriber data generation in case of exchange extension, installation of new exchanges, network traffic reallocation, introduction of network control etc.:
- improvement of exchange maintenance software;
- acquisition and analysis of statistical information on the errors in the exchange software within the OPC zone and transmission of these data to SDC.
- training of staff working at exchanges and software operation nodes.
- assistance to exchange staff in difficult cases of errors in software identification.

13.4.8. Software maintenance at non-assisted exchange should be provided by OPC staff. Software maintenance on assisted maintained exchanges should be provided by the proprietary staff.

13.5. Following equipment can be used on urban telephone networks:

- step-by-step central offices - step-by-step exchanges with capacity up to 10 000 lines.
- relay, crossbar exchanges (up to 20-30000 lines).

- Pentacohta 1000c - relay crossbar exchange (up to 20000 lines).

- PSK-1000 (PSK-1000K) - relay crossbar switch (from 400 up to 1000 lines).

- SKI - crossbar mixing switch, used in switching OTL nodes.

- ATCKE - stored - program - controlled semielectronic exchanges (up to 20000 lines).

- MT-20 25 - stored- program - controlled, electronic digital exchanges. The capacity of terminal exchange is up to 20000 lines (subscriber unit traffic is up to 0,1 Erl);

The capacity of transit exchange is up to 8000x 2 trunks (total transit traffic is up to 3000 Erl).

ATC-200-stored-program controlled electronic exchanges from 60 up to 3500 lines (ATC-210) and from 500 up to 17000 lines (ATC-220) (subscriber unit traffic is up to 0,15 Erl).

The main features of exchanges and nodes, operating on UTN, are shown in Tables 13,2a and 13,2,b.

13.6. In rural telephone networks following equipment can be used:

- ATCK-50 (200,ATSK-50/200M - relay crossbar exchanges (up to 50-200 lines).

- ATCK - 100/2000 - relay crossbar exchanges (up to 200 - 4000 lines).

- ИАТСКЭ - stored - program-controlled semielectronic analogue-digital exchange (from 64 up to 4036 lines).

- ATCKE-S - stored - program - controlled semielectronic exchanges from 64 up to 2048 lines.

The main features of exchanges operating on RTN, are shown in Tables 13.3a and 13.3.b.

13.7. Equipment for directory, ordering and emergency services.

Equipment, required for services implementation over telephone networks, is shown in Table 13.4. This equipment is manufactured actually and should be used at the phase of UATS elaboration.

13.8. Terminal Subsriber's telephone stations

The main types of terminal subscriber's telephone stations to be used in PSTN are: telephone sets equipped with rotary push-button-pulsed and push-button - multifrequency dialer; pay phones in private and toll telephone networks: telephone with amplifiers, autodialers; special and multifunction telephone sets.

The information of main types of subscriber terminal equipment being used, manufactured or under development, is given in Table 13.5.

Besides subscriber terminal equipment mentioned in Table 13.5., devices functionally similar will be used in telephone networks, which should be developped, manufactured and used at the Phase 2 of UATS elaboration.

In addition any technical equipment compliant with "Specifications for Subscriber Sets, Concerning Algorithums of Interfacting UATS's Dial-up Network", approved 26.07.85, can be used on telephone networks.

Table 13.1a Main Characteristics of AMTC-1M, AMTC-2, AMTC-3

Characteristic	AMTC-1M	AMTC-2	AMTC-3
1	2	3	4
Purpose	Terminal (only outgoing)	Terminal	
Equipment	Step-by-step	Relay controlled crossbar	
Number of lines and channels	180 channels	3000x2 channels	700x2 channels (outgoing chan nel is connected to two points of switching network)
		Provide required number of OTL and TTL	
Capacity (Erl)	130	2100 at MC stage	500 at MC stage
Number calls handled at busy hours	4000	60000 at MC stage	70 at MC stage
Number of routes	40(LSR-2,DR-38)	200 at MC stage	70 at MC stage
Route capacity	Unlimited		
Possibility of building bypass toll network	Possible bypass by LSR	Possible arrangement of required number of bypasses	
Possibility of building integrated bypass network in a zone with several	No		
Connection to CO by OTL and TTL	Only over OTL (without interme-diate equip ment)	By intermediate equipment (ЕЙ-registers ВРДБ)	
Possibility of route selection by primary five characters of toll telephone number in toll network in intrazone network		No	
Line signals transmission	in toll network	two –frequency	
	in intrazone network	battery	One-frequency, channel associated, battery
Control signals transmission	in toll network	decadic	
	in intrazone network	decadic	mutlifrequency-by OTL, decadic Via TTL
Call handling sysytem		No preference handling for priority calls. Total calls handling with losses (IV class priority)	
Switching board equipment		-	cordless / cord
Echo cancellers connection		Assigned channel	
Maintenance		Preventive maintenance, no testers	Preventive maintenance, testers check channels, TTLs, registers, markers

Table 13.1a (continued)

1	2	3	4
Traffic and service quality control system. Interconnection with control center		Service quality and traffic control by LSR and other routes with counters Readings are taken manually. Data transmission to the center-via telep hone	Route traffic and number of seizures monitoring with erlangometer, recorders,counters Readings are taken manually. Data transmission to the center-Via telephone
Charge accounting		Centralized. Output to a punh card punch tape	Centralized. Output to perfo card, perfotape, magnetic tape
Application		Not intended for network and exchange development, production is stopped	Allowed for existing network and exchange development

Table 13.1b Main Characteristics of AMTC-5, AMTC-6, AMTC-7, AMTC-8, AMTC-10

Characteristic		AMTC-5	AMTC-6	AMTC-7,8	AMTC-10
1		2	3	4	5
Purpose		Terminal,transit-terminal		Terminal, transit-terminal, tranzit	
Eguipment		Relay control led crossbar	SPC crossbar	SPC semi-electronic	SPC electronic
Number of inputs and outputs		4000 x 2	4000 x 2	12000 x 2	16000 x 2
Capacity (Erl)		2600	3000	6000	6400
Number of calles handled		70000	1000000	15000	150000
Number of routes		160		unlimeted	
Route capacity		90 (up to 450 due to bypasses)	Unlimited		
Possibility of toll bypass net-work building		Up to 4 bypasses possible	Possible arrangement of required number of bypasses		
Possibility of building united bypass network in a zone with several ATEs		Yes			
Connection to CO by OTL and TTL		Matched interconnection without intermediate equipment			
Possibility of route selection by primary five characters of toll telephone number		Yes			
Line signals transmission	in toll network	One-frequency, two frequency	CCS, one-frequency, channel associated battery		
	in intrazone network	One-frequency by delicated signal channel battery			
Control signals transmission	in toll network	One-frequency, two frequency	CCS, one-frequency, channel associated battery		
	in intrazone network	One-frequency channel associated, battery			

Table 13.1b (cont.)

1		2	3	4	5
Control signals transmission	in toll network	Multifrequency, decadic	Multifrequency, decadic by OTL-CCS Myltifrequency, decadic by TTL-CCS		
		Decade by OTL (Nб) multifrequency(Na) Multifrequency, decade by TTL			
Call handling		Calls handling with III, IV class priority		Cals handling with I-IV class priority	
Switching equipment type		cord	cord	cord electronic (2	cord electronic (2
Echo canceller connection		Assigned channel		Assigned and group connection (only AMTC-7)	
Maintenance		Error-correction method. Testers check channels, CO equipment, TTL exchangbe from any input to sepate outputs	Error-correction method. Special maintenance processor and testers provide monitoring of channels TTL and exchange equipment	Error-correction method. Hardware software testers monitor channels,TTL exchange operation. Automatic troubleshooting. Automatic recovery of central and peripheral controls by their reconfiguration in case of failures	
Traffic and service quality control. Inter connection with control centers		Traffic, service quality and number of seizures control over total routes carried out by testers and counters Readings are taken manually. Data transmission to the control center-Via telephone and telegraph			
Charging accounting		Centralized. Output to card or magnetic tape	Centralized Output to magnetic tape and printer	Centralized. Output to punch, magnettic tape. For semi-electronic exchange optional output to magnetic tape followed by dumping into data channel or direct readout into data channel directly	
Application at the first UATS stage		Existing exchanges extension	Network development		

1. Channel eqipment for one-and two-frequency signalling can be used during CCS introduction.

2. Switching equipment of electronic type – versutile operator positions with displays, designed for ATE (CO) recording information and toll services.

Table 13.2a Main Characteristics of Urban Telephone Exchanges and Nodes

Characteristic	АТСДШ (АТС-47,54,54А)	АТСК (АТСК)	Pentakonta	ПСК-1000К
1	2	3	4	5
Purpose	Terminal, transit (ОТТ, ІТТ, УВСМ,)	Terminal, transit (ОТТ ІТТ, УВСМ, RSN)	Terminal	Remote switch
Equipment	Step-by-step	Relay controlled crossbar		
CO subscriber capacity or node capacity	Up to 1000	Up to 20000-30000	Up to 20000	From 400 to 1000
Number of trunks	Unlimited			78 outgoing, 90 incoming
Number of routes	10 at cach GS stage	Up to 20 at each GS stage	Up to 100	One
Availabitily	10	20-60	any	20
Unit traffic per subscriber line (Erl)	Up to 0.15			Up to 0,1
Line signals transmission	1. Battery, within exchange and physical lines 2. Loop signalling, by two-wire physical lines 3. 3825 Hz frequency out of bend assorrated channel 4. PCM CAS (time slot 16)			Battery, with subexchange and by physical trunks, loop, by two-wire physical lines
Control signals transmission	Decadic	Multifrequency with crossbar COs, АТСКЭ and АТСЭ Decadic with АТСДШ and rural АТСК (y)		Decadic (Multifrequency bar incoming connections ПСК-1000К)
Additional services	No			
Traffic and service quality control	Electromechanical counters, УН rack, "auto trainer" and automatic control device		Electromechanical counters, traffic measurement devices	Electromechanical counters
Maintenance	Preventive maintenance with 24 hours service for COs having up to3000 numbers and heatprotected selectors noncontinuous service is allowed)	Error-correction with reduced preventive maintenance and non-cotinuous service		
Dialing	By rotary or pulse pushbutton dialer			
Application at II UATS stage	Allowed for existing step-by-step exchanges development	For UTS development and existing crossbar exchanges extension		For UTS development

Table 13.2b. Main Characteistics of Urban Telephone Exchanges and Nodes

Characteristic	СКИ	АТСЭ	МТ-20, 25	АТСЭ-200 (АТСЭ-210, АТСЭ-220)
1	2	3	4	5
Purpose	Mixing selector for OTLN switch node (used together with standard СПАТС sets)	Terminal, transit, joint (transit-terminal), subexchange		
Equipment	Relay controlled crossbar	SPC semi-electronic	SPC electronic	
CO subscriber capacity or node capacity	-	Up to 20000 at terminal exchange	Up to 20000 at terminal exchange with traffic 2000Erl	Up to 17000 at 2500 Erl
Number of trunks	Incoming:60-240 Outgoing:90-360	Up to 4000*2 at TrO Up to 15% capacity at termi nal eschange	Up to 8000*2 at a node with up to 3000 Erl. Up to 15% capacity at terminal office with total traffic up to 2000 Erl	Up to 200 PCM systems with bit rate 2048 kbit/s
Number of routes	One	Any		
Availability	Up to 90	Full		
Trunk capacity	Up to 360		Any	
Telephone traffic per subscriber line (Erl)	-	Up to .15	Up to 0.1	Up to 0.15
Line signals transmission	Battery, within OTLN	Communication with subexchanges:by Common Control Channel communication with exchanges of the same type: by CCS; non-CCS, communication of step-by-step and crossbar systems with CO:by methods specified for these systems		
Control signals transmission	Method specified for CO and ATE (through signal transmission over switched circuits no signal processing by СКИ-equipment)	Communication with subexchanges:by Common Control Channel communication with exchanges of the same type: by CCS; or multifrequency code "2 of 6" using "pulse shuttle" technique; communication of step-by-step and crossbar systems with CO: by° -°methods specified for these systems		
Additional services	No	Yes		
Traffic and service quality control	Automatic control device	Automatic program control		
Maintenance	Preventive with reduced maintenance and non continuous service	Error-correction method with automatic program control of sation exchange equipment soundness, non-continuous service		
Dialling	-	Rotary or push-button (pulse or miltifrequency)		
Application at UATS stage II	Enlargement of OTL groups	Perspective for UTN development		

Notes to tables 13.2a and 13.2b:

1. Exchanges with above mentioned characteristics can be used in combined telephone networks as well.

2. АТСК (АТСКУ) equipment can be used at rural telephone networks as well.

3. СКИ equipment can also be used in multiexchange networks of rural district centers.

Table 13.3a. Main Characteristics of Rural Telephone Exchanges

Characteristic	АТСК-50/200	АТСК-50/200М	АТСК-100/2000
1	2	3	5
Purpose	To and TrO	To	CO, TrO, TO, RSN
Equipment	Relay controlled crossbar		
Subscriber capacity	50 - 200 numbers		200 - 4000 numbers
Number of trunks	TO: from 5 to 13, capacity-dependent TrO: up to 49	TO: from 7 to 17, capacity-dependent	Unlimited
Number of routes	TO: 1; TrO:up to 15	2	Up to 20 at each GS stage
Availability	Full		10 - 20
Route capacity	TO: up to 13, capacity-dependent TrO: up to 18	Up to 17, capacity-dependent	Unlimited
Subscriber line unit traffic,Erl	Up to 0.1		
Line signals transmission	1. Battery, within exchanges. 2. Inductive, by physical trunks. 3. Frequency, out of band channel associated (at 3825 Hz) 4. Two-frequency, at 3825 Hz and 2600 Hz. 5. Channel associated signalling in PCM links		
	6.		Battery, for communicati on with urban АТСДШ and АТСК
Control signals transmission	Decade		Polarity-numerical within own CO and in communi-cation with sametype COs by physical lines; decadic for communication with other type COs and same type COs Via transmission systems
Additional services	No		
Traffic and service quality control	Electro-mechanical counters		Electro-mechanical counters and auto trainers
Maintenance	Preventive maintenance with operating stuff routine inspection, transmission of alarms is provided to the attended CO of higher hicrarchical level		Error-correction with reduced preventive maintenan-ce. Alarms transmission to the attended CO of higher level of hicrarding and reception of those signals from CO of lower level indepen dent of operating stuff presence at level CO lower
Dialling	By rotary or pulse push-button dialer		
Application at UATS II stage	Used for RTN development		

Table 13.3b. Main Characteristics of Rural Telephone Exchanges

Characteristic	ИАТСКЭ	АТСКЭ-С
1	2	3
Purpose	ИАТСКЭ1: CO, TrO, TO, RSN ИАТСКЭ3: TO	CO, TrO, TO, RSN
Equipment	A/D, SPC semi-electronic	SPC semi-electronic
Subscriber capacity	From 64 to 4096 numbers, purpose-dependent	From 64 to 2048 numbers, purpose-dependent. Capability of extension by blocks 64 or 128 numbers
Numbers of trunk lines	ИАТСКЭ1: from 16 to 1024 ИАТСКЭ3: from 2 to 30	From 6 to 192, purpose-dependent
Numbers of routes	ИАТСКЭ1: from 2 to 64 ИАТСКЭ3: 2	From 1 to 32, purpose- dependent
Availability	Full	
Route capacity	Unlimited	
Subscriber line unit telephone traffic (Erl)	Up to 0.2	Up to 0.2
Line signals transmission	Within own network Via Common Control Channel and CCs. By methods specified ATCK-100/2000	By methods specified for АТСК -100/2000
Control signals transmission	Within own network by Common Control Channel and CCS. Multi-frequency, in communication with АТСК, АТСКЭ-С and same type exchanges. Decadic in communica-tion with АТСДШ and rural crossbar COs	Multifrequency in inter connections with same type COs, ИАТСКЭ and АТСК and decade, in communication with АТСДШ and rural crossbar COs
Additional services	Provided	
Traffic and service quality control	Automatic program control	
Maintenance	Error-correction. Software/Hardware control of equipment functioning	
Dialing	Rotary or pulse push-button and multifrequency dialers	
Application at UATS II stage	RTN development	

Notes to Tables 13.3a and 13.3b:

Exchanges with above listed characteristics are used in combined.

Telephone networks as well.

Table 13.4. Equipment for Emergency, Recording and Inquiry Services and Their Connection into Telephone Networks.

Name of Equipment	Purpose and Application
1. Inquiry service equipment (АСПС)	For UTN inquiry services. Provides customer services in local intrazone and toll Telephon networks with capacity up to 150000 numbers
2. The rack of АТСК-У special block from ДГИ equipment	Provides division of zero trunk group (crossbar CO GS outputs down to special services) by analysis of the second (third) digit of special service number dialed by subscriber. Designed for АТСК (АТСК-У) subscribers communication with emergency and recording services and to equip SSN of crosbar type
3. The information units rack for inquiring services (СКИ-СИС)°	Designed for connecting lines of UTN and RTN communication with automatic information services to the following equipment: time of day announcement equipment; individual and group automatic informers
4. The rack of corrective amplifiers (СКУ-СИС)	Designed to correct amplitude-frequency distortions of information induced by service lines and also to provide protection of subscriber lines from intelligible cross-talk when listening to autoinformation service messages. The rack's used for providing communication with UTN, RTN and information services
5. Time of day equipment (АСВ)	Designed to provide subscribers, emergency and other services of large voice announcemnts capacity UTN with time information (accuracy up to minute)
6. Universal auto informers	Designed for delivering inquiry information with messsage duration from 10s to 60s. Provide from one to six different messages semiltaneously. It is used as auto informer of UTN and RTN services, delivering information in different directions.
7. Electronic speech auto informers	Can be used: - in auto information and recording services as terminal automatic cource of voice announcement on inquires of local, intrazone and tall telephone network subscribers; - as automatic answerback devices and dictophones for emergency, inquiry, recording and other services; - in local, intrazone, toll and other network equipment for service-information phrases delivery at different stages of call handling and set up; - allow spoken information record and playback as long as 180s

Table 13.5. Main Types of Subscriber Telephone Sets

Types of Subscriber	Model	Purpose and General Characteristic
1	2	3
1. Common telephone set		
1.1.Rotary dial sets	ТА-68, ТА-68М, ТА-72, ТА-72М, ТАН-70, ТАСт-70, ТАН-76, ТА-1138, ТА-1142, ТА-1144, “Спектр” (ТА-1128, ТА-1146, ТА-1148, ТА-1162, ТА-1164, ТА-1166), “Вента” (ТА-1153, ТА-1155, ТА-1157), ТА-1165 “Стелла”, ТА-1173 “Ретро”, ТА-1131 “Лана”, ТА-1158 “Тон”, “Парма” (ТА-11540), ТА-11541), “Спектр-3” (ТА-11320, ТА-11321), ТА-11432 “Элта-Д” and some other domestic sets of similar kind;	Connection to CO with DC dial pulse ransmission
	ТА-3100, ТА-4100, ТА-600 (Bulgaria), СВ-666-К, СВ-667-К (Hungary), W-66, “Вариант” (Germany), ЦБ-664, “Астра”, “Яскер”, “Тюльпан” (Poland), Т-65S, ТП-66Sa, Бс-23 (Chechoslov.) and some other foreign sets of similar kind	Parameter requirements for telephone sets to be manufactured are ГОСТ 715385 - compliant
1.2. Telephone sets with pulse pushbutton dialer	ТА-1152, “Электроника ТА-5”, “Электроника ТА-7”, “Спектр-2” (ТА-51160, ТА-51161) and some other sets of the same kind	Purpose see in 1.1 Parameter requirements for telephone sets are ГОСТ 25554-82 - compliant
1.3.Telephone sets with frequency pushbutton dialer	Development should be finished in the XII five-year period	Connection with Semielectronic and electronic COs
1.4. Dialerless telephone sets	ТА-2114, АТ-218, ТА2116 “Спектр”, ТА-21220 “Спектр-3” and some other sets of the same kind	Designed for ЦБ РТС telephone exchanges
2. Local telephone network payphones	АМТ-69/2, АМТ-69/5, АМТ-69/15, ТГС	Provide local telephone communication when connected to COs providing battery voltage reversal down payphones party answer. Effective tariffs are 2,5 or 15 copesks. Ringer connection is allowed to use the sets as talk back payphones ТГС payphones provide operation in self contained charging mode with the call prolongation over three minutes on additional pay and distant payphones technical state control

1	2	3
3, Toll network payphones	MTA-15-2, MTA-15-3, MTC-4, MTA-6, TMCH-1502 and few types of foreign phones	MTA-15-2 and MTA-15-3 are exchange controlled multizone (10 zones) payphones with one-nominal coin mechanism (15 copecks). Connection with ATE by dedicated channels. MTA-4 and MTA-6 are desig-ned for connec tion to transit Cos with output to ATE via OTLs.These payphones provide selfcontained charging of calls. TMCH-1502 is connec ted to transit COs via additional equip-ment having output to ATE via OTLs MTA-4, MTA-6 TMCH-1502 are multizone payphones with three nominal coin mecha-nism (10, 15 and 20 copecks). MTA-6 provides capability of calls set up
4.Telephone sets with amplifiers	ТАН-У-74, ТА-72-УП, ТАУ-5108, ТАУ-03, ТАУ-04	ТАН-У-74, ТА-72-УП and ТАУ-5108 are designed for sub-scriber lines loss from 6 to 24dB
5.Telephone autodialers	“Трель-1”, “Трель-003”, “Busa-2”, “Электро-ника ЭКСИТОН 01”, “Электроника ЭЛЕТАП микро”, “ЭЛЕТАП”, “Автонабор-24”, АН-4С 8*60 “Элетап-2”, ТА-1143 0ИН “Элта" and some other types of the same kind	Designed for connected to CO by DC pulse dialing.Provide re-cord and long-time storage from 20 seven-character numbers ("Трель") to 60 eight-character numbers ("Элетап" and "Эле-тап-2") andmultiple one-touch dialling of any stored num-ber.Parameter requirements for devices to be manufactured are standard 7153-85 - complied
6.Special funct-i-on and multifun-ction devices	Automatic answerback equipment-АТГ and АТГ-2, diode-triode attachment ПДТ-1 for parallel telephone sets connection, subscriber line multiplexers АВУ; У-5116 and У-5118“Дельта”, concentrators К-3, К-3-1, КАС-2, К-1151 “РИФ” and other devices	Special functions extending telephone communication capa-bility. Parameter requirements comply with approved technical documentation

14. GUIDLINES FOR NORMALIZATION OF TELEPHONE CHANNELS

14.1. Normalization of telephone channels is performed both for existing, and future PSTN which is based on primary standard network UATS channels consisting of analog, digital and combined ones. Links, primary network channels are normalized using the corresponding nominal circuits.

14.2. Normalization of telephone channels is provided according to standard private zone, toll and international network.

14.3. Perspective nominal circuits, associated with primary network's nominal ones, should be defined and the normalization is realized according to these circuits.

14.4. One should normalize:

- subscribers private zone and toll telephone channels (subscriber-to subscriber, taking into considetation telephone set);
- private, zone and toll telephone channels (from the first subscriber line input up to the second subscriber line);
- a section of subscriber international telephone channel (from subscriber up to virtual switching point of international exchange, taking into account telephone set);
- a section of international telephone channel (from the first subscriber line input up to virtual switching point of international exchange);
- sections of toll (zone) telephone channel:

"ATE (ZTN) - ATE (ZTN):

"OTT(CO) - OTT(CO)"

"CO(TO) - CO(TO)"

-sections of local telephone channel:

CO - CO

OTT - CO (CO - TO)

ITT CO (CO - TrO)

Note: Subcriber telephone channels telephone channels and their sections which can be organized by DR IAR and LSR, are normalized.

14.5. The telephone channel is normalized, in accordance with following characteristics:

- common (for all telephone channels),
- electrical;
- phonemetrical.

14.6. Common characteristics normalization for telephone channel is carried out using the parameters:

14.6.1. Signal power input of the telephone channel, in the zero level reference point of primary network speech channel.

14.6.1.1. Power requirements for subscribers voice signals:

- Average continuons power of subscribers voice signals (activity factor is 0,25);
- maximal power level of sine signal on the calling subscriber line input at the telephone set's side, conforming to average power (level) of active direct subscriber's voice signal (nearest subscribers signal at the hybrid set output on the transmission path) is 88 pWo (-10.6 dBm) for multiple subscribers.

14.6.1.2. Power parameters of international perators voice signals:

- average continuous power of operators voice signals (activity factor is no more than 0,03);
- average power of voice signals during active time intervals.

14.6.1.3. Power parameters of line, control and acoustic signals:

- average continuous power of line, control and acoustic signals, using any connection establishing method, signalling system and any direction of transmission;
- power of separate control, line and acoustic signals.

Note: Seferate normalization of line, control and acoustic signals is to be carried on the future.

14.6.1.4. Average continuons, maximum average power per hour and average per minute for data, FAX, teletyping and electronic mail signals.

14.6.2. Effective bandwidth of telephone channel 4-wire sections.

14.6.3. Input resistance nominal value for telephone channel 4-wire sections.

Reflection factor with respect to nominal value of telephone channel 4-wire sections in the range of 300-3400 Hz.

14.6.4. Nominal relative transmission levels at 1000 Hz in the 4-wire voice channel and telephone channel switching points.

14.6.5. Residual attenuation nominal value forr 4-wire telephone channel at 1000 Hz.

14.6.6. Transmission quality for different message signals (subscriber's difficulty percentage or subscriber estimation, error rate).

14.6.7. Connection stability.

14.6.8. Probability of intelligible crosstalk.

14.6.9. Probability of echo.

Notes: 1. Quality of voice signals transmission for uniform channels is determined in accordance with Recommendations CCITT.

2. Probability of intelligible crosstalk is determined in accordance with Recommendation Q.116, V.III, I, Yellow Book.

14.7.Normalization of telephone channel electrical characteristics is carried out, using the following parameters.

14.7.1. Residual attenuation at 1000 Hz, its average value deviation from nominal one and residual attenuation standard deviation in time. Distributed attenuation values for uniform telephone channels.

14.7.2. Frequency variation.

14.7.3. Step phase change in the time domain.

14.7.4. Frequency-gain characteristic of residual attenuation.

14.7.5. Absolute time of group propagation, frequency characteristic of group propagation, time variations.

14.7.6. Transfer-gain characteristic.

14.7.7. Noise.

14.7.8. Selective interferences.

14.7.9. Level of protection from intelligible crosstalk.

14.7.10. Total relative time of pulse interferences and short level losses.

14.7.11. Pulse interferences.

14.7.12. Short level losses.

14.7.13. Level of protection from interference modulation.

14.7.14. Phase jitter.

14.7.15. Non-linear distortions.

14.7.16. Error rate.

14.7.17. Stability, including hybrid set attenution.

14.7.18. Total distortions, including quantization ones.

14.7.19. Input out-of-band signals supression.

14.7.20. Parasitic out-of-band signals at the channel output.

14.7.21. 3d-order-combinational components level (for example, 2f1-21).

14.7.22. Maximum level of any interference from signalling.

14.7.23. Overloading threshhold.

14.8. The normalization of phonemetrical characteristic is defined by voice signals loudless specified in CCITT's recommended units (equalized attenuation equivalent - EAE).

14.9. The normalization of common characteristics (14.6.6.-14.6.9.) is carried out, taking into account telephone signals transmission or other messages to subscriber, transmission quality being convenient.

In addition, all the factors (EAE, noise, frequency response, local effect etc.), if possible, should be included into at "transmission quality of different message signal" (14.6.6.) parameters for voice signals, which adversely affect speech transmission, and the evaluation of this parameter should be performed, taking into account convenient quality of connections, which present unfavourable combination of tolerances, used separately.

14.10. The normalization of telephone channel electrical characteristics is carried out taking into account electrical parameters specification for:

- tone channels of UATS's trunk, zone and local primary network;
- speech paths of automatic nodes and exchanges;
- subscriber and trunk lines.

14.11. The normalization of phonemetrical parameters for a subscriber telephone channel is carried out, taking into account phonemetrical parameters specification for:

- tone channels of UATS trunk, zone and local primary network,

- speech paths of automatic nodes and exchanges,
- subscriber and trunk lines,
- telephone set.

14.12. The normalization of telephone channels should be carried out, taking into account requirements of all customers and proceeding from message transmission conditions on last selected route.

14.13. The development of specifications for customer premises equipment (CPE) is carried out proceeding from operation standards for telephone channels.

14.14. The normalization of telephone channels, automatic nodes, and exchange speech paths, subscriber and trunk lines is carried out using the same parameters to provide their compatibility, use of unified measurement equipment and unified methods for failure locations identification.

14.15. The normalization of telephone channels realized by time - and space - switching equipment in the FDM and IDM equipment is usually carried out using the some parameters.

In telephone channels, organized by digital, radio-relay, troposcatter or satellite transmission systems several parameter deviations are allowed.

14.16. The normalization of telephone channels is carried, taking into account CCITT, CCIR Recommendation of UATS primary network documentation, principles of UATS development, as well as measurements of used telephone channels quality and subscriber requirements for telephone service quality.

14.17. Operation standards are fixed for telephone channels.

Operation standards are fixed for sections of toll, zone and local telephone channels (ATE-ATE, CO-CO etc.), which are to be tested.

Notes:

1. When these sections contain transmission systems, adjustment standards are fixed for primary network's tone channels.

2. Parameters of ATEs are compliant with adjustment standards, operation ones for them will be defined later.

14.18. Adjustment standards for several sections of future PSTN are the base for the development of communications equipment specifications.

Taking into account special features of equipment, inaccuracy of determination of laws of distortion accumulation, depending on amount of equipment,

adjustment errors, a relative adjustment standards margin is provided to keep operation standards.

14.19. Nominal or maximal tolerated parameters should be defined during norm development.

In the future the normalization should be carried usually in statistical way,i.e. by defining normalized parameters statistical characteristcs (average value, standard deviation, correlative factor) or parameter values, which are defined with a determined probability.

14.20. Using operation standards, ones for all types ofcontrol (operation and technical) are defined.

The quality of parameters to be controlled is defined as minimal as possible. For that, minimization of parameters, determination of generalized parameter and continuosly controlled parameters is made.

14.21. While normalizing electrical parameters, the measurement procedure, as well as a required measurement equipment as an integral part of specifications, is developed simultaneously.

The measurement procedure supposes to use computer-based measurement equipment, as basic tools, for evaluation telephone channels.

The use of procedures, which are not computer-based, is assumed for parameters, being time-stable and thus measured rarely.

The development of the measurement procedure is carried out taking into account a possibility of providing measurements by night or when a telephone channel or its sections are not busy.

In addition to measurement procedure, the procedure is developed then for definition of a section, which causes a telephone channel to deviate from specifications, the accuracy of measurement being up to node or a link between nodes in this telephone channel.

14.22. The electrical parameters of line, control and acoustic signals with any connection establishing method, signalling system in any transmission direction, are defined in the issue 7.

14.23. The normalization of subscriber local, zone, toll, international telephone channels (from "subscriber-to--subscriber" taking into account telephone sets) and its sections is carried actually, using EAE.

14.24. The normalization for the number of "analogue-digital-analogue" channels in analogue-digital telephone channel is carried, taking into account a maximum-tolerated number of transmission degradation units in

consequence of quantization distortions; this is to be defined in telephone channel specifications.

14.25. The normalization is carried systematically, adopted normes are detalized in the process of testing and maintenance experience accumulation.

The validity period for specifications is usually no more than 5 years. The network specifications are established with associated orders of Ministry of Telecommunications.

14.26. The State Standardization of specifications documents is carried out.

14.27. "The Perspective specifications on electrical parameters of PSTN's Channels" are given in the book 2 of Set of Rules.

15. PRINCIPLES OF CALCULATING A NUMBER OF CHANNELS IN THE ALTERNATIVE ROUTE NETWORK

15.1. The task of calculating needed number of toll telephone channel is the definition of a number of direct and alternative routes (DR, IAR and LSR) for providing a required service quality at minimal capital investments switching equipment and equipment for primary network.

The cost of alternative route network depends on traffic distribution in direct and alternative routes, so the task of calculating an optimal number of channels for both types of routes should be solved.

15.2. The calculation of number of channels in toll telephone network should be computer-based.

The program is based on the new network calculation method using a principle of network's economic optimization and UATS Recommendations or using of modules of transmission systems primary group to design channel bundle.

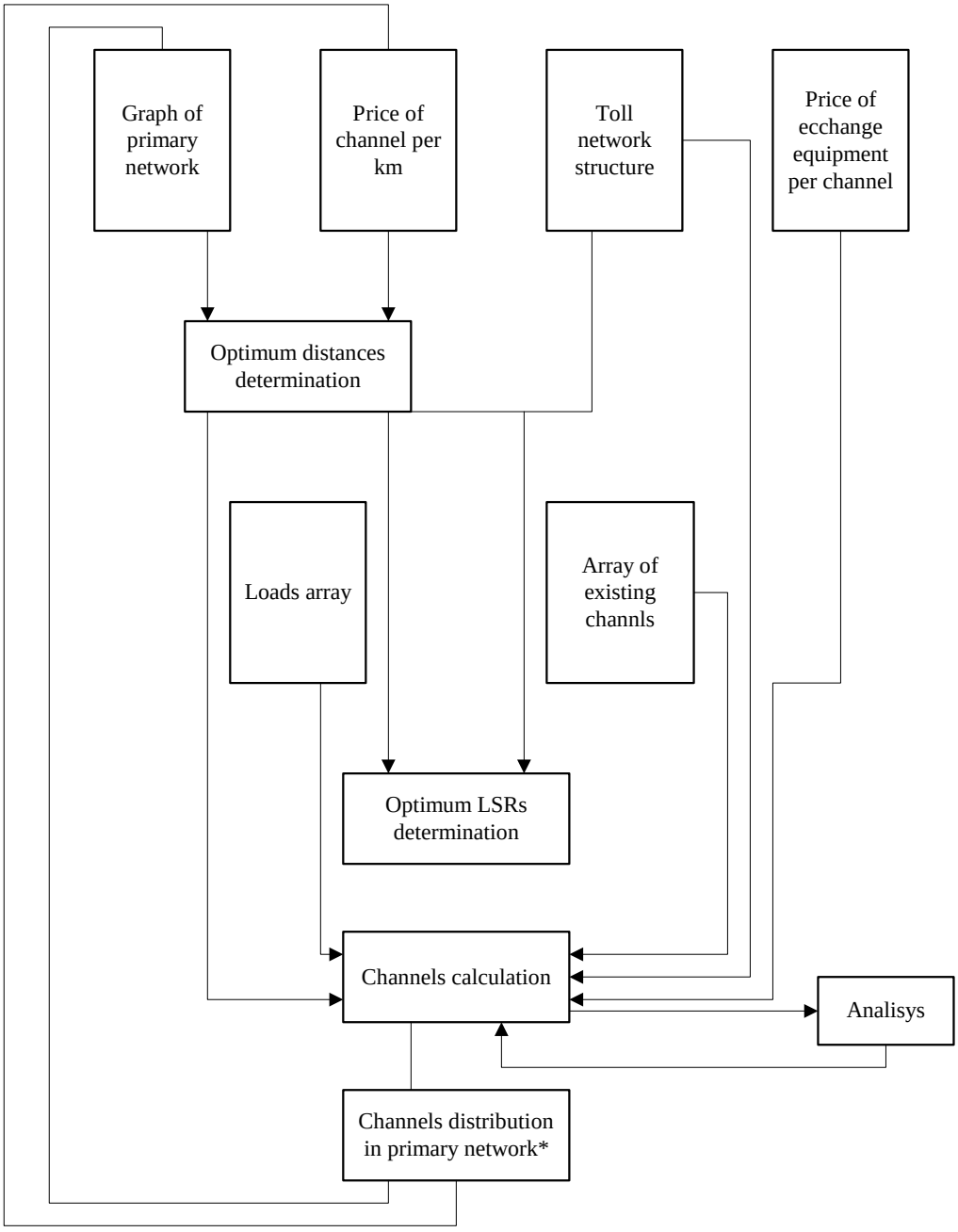
The method is based on requirement to provide a minimum cost of network, when the total capacity of incoming and outgoing direct route bundles and the capacity of alternative route bundles to other ASN are divisible by the integer number of transmission systems primary group modules. The primary group for analogue network contains 12 channels.

15.3. The conditions of number of channels is carried according the following (Fig.15.1.).

15.3.1. Shortest distances between all exchanges and nodes on the network and an optimal LSR for each ATE's line are determined.

15.3.2. The number of channels for DR (incoming and outgoing), IAR

and LSR are calculated for each ATE. The iteration method is used.



* The distribution is carred out in accordance with the primary network calculation program

Figure. 15.1. Block-diagram of channels number calculation in toll telephone network

15.3.3. DR channels computation is carried, using total incoming and outgoing traffic between each ATE's line according to Erlang equation.

15.3.4. IAR channels computation is carried, using total redundant small traffic in DR bundles, for which this path is alternative.

During computations, redundant traffic's peak mode is taken into account;

computation of number of channels is carried, using an equivalent replacement method.

15.3.5. Computation of number of channels in each LSR's section is carried, using total redundant and small traffic in DR and IAR bundles.

The summa of traffic on each LSR's section is defied, taking into account codes, transmitted in this section. The channel bundle capacity is defined, using an equivalent replacement method (loss probability per section is 0,01).

The total channel bundle capacity (for both directions) in each LSR's section is the nearest integer number of modules, which exceeds the calculated value.

15.3.6. Following initial data used are for calculation:

- expected traffic matrix;
- primary network's graph, which contains nodes with indication of their locations branches with indication of their length (L) and channel-per-km's cost (C);
- фЗи and ATE's average cost per 1 channel;
- network's structure;
- existing channel bundle matrix.

15.3.7. Since the distribution of defined number of channels by the primary network's transmission system, analysis of calculation results for toll network and required refinement of initial data, the calculation of number of channels for toll network is repeated under the same program.

16. CHARGING, CHARGE ACCOUNTING AND SUBSCRIBER PAYMENTS

16.1. Charging.

16.1.1. Communications service charges are state-planned prices, at which communications carriers provide services to different customers.

The main services in telephony are transmission through international, toll, zone and local networks of telephone conversations, data, facsimile messages and electronic mail ones.

The economic base of service charges should be their cost, including average service prime cost and some normal profit.

The service charging is based on charging by time and by distance which are used separately or in parallel.

16.1.2. Charging of message transmission in international, toll and zone networks is based on duration time. Payment for message transmission is defined, taking into account duration time, distance, preferential time of day (for automatic communications only), urgency (for semiautomatic communications only) and message type.

The charged duration of message transmission "should be defined from called subscriber's answer" up to any subscriber's "clearing".

Depending on distance, there are 5 charge zones by continents and 6 charge positions for paying a message transmission in international network and up to 10 charge zones for toll and zone networks.

A preferential charge provides for automatic communications a reduction at 25% during pre-defined low-traffic time of day and by day-off and holidays, as well.

Threefold price is used for urgent messages at semiautomatic communications.

The data transmission payment is carried, using a double charge. Charging for fax and electronic mail will be fixed later.

Preferential time up to 20 sec, should be provided for automatic connection establishment. Talks, which are shorter than preferential time should not be charged.

16.1.3. Local telephone service charging should be carried, using one of following methods:

- subscription payment - for telephone networks, where charging by time is not used;
- hybrid system - use of charging by time and subscription payment;
- charging by time (during pay phone talks).

The subscription payment will depend on:

- subscriber's class (home, office etc);

- provided telephone services;
- terminal subscriber station.

The introduction of charging by time should be started in each local telephone network for all subscribers simultaneously.

Program-controlled exchanges should provide value-added services to local network's subscribers, which will be charged both by subscription and by single payment (depending on number of value-added services used).

16.2. Charge accounting for telephone services

16.2.1. Charge accounting is collection of data, which will be used to define subscriber's debits, concerning telephone services.

These data can be used also during for operation.

16.2.2. Charging main services by time for local network's subscribers is carried in CO. This accounting is provided by accumulation of subscriber's debits ("common account").

Charge accounting of local talks for PABX subscribers should be provided at CO by accumulation of each PABX outgoing trunks "busy" time. The possibility of charge accounting for any one PABX subscriber should be allowed.

Charge accounting of directory services should be carried whether in CO, or in фжж.

16.2.3. During zone and toll communication, charge accounting of services, using subscription payment for local communication, is carried at ATE by mens of detailed data recording for each talk. Charge accounting, using charging local communications by time, can be carried whether at ATE or at CO.

16.2.4. While accounting toll and zone services, CO should allow to meter detailed data on each talk in accordance with subscriber's desire as a payment service.

16.2.5. Charge accounting of services for automatic international communications should be carried in international exchange (for subscriber of the zone, where this exchange is located), ATE or CO. In all these cases a detailed accounting of each talk is carried on.

16.2.6. It should be possible to install individual subscriber accounting devices in customers locations for controlling charging correctness by subscriber when charging is performed by CO.

16.2.7. The charging of automatic communications services should be carried in crossbar ATE, using its own equipment, data being dumped usually to the tape.

16.2.8. The charging in programm-controlled exchanges should be performed by the central processor, accounting data being dumped to tape drives or to the computer centre through data channel. The recording format is defined in charging system specifications. In the future, a common format should be developped.

16.2.9. Charging for toll and zone services with semiautomatic connection method should be performed by the operator, making out a receit, or using a special equipment.

16.3. Subscriber payments for telephone services

16.3.1. Susbscriber payments for telephone services should be provided with no prepayments (on credit). Accounting system should provide following operations:

- acquisition of data on provided services, fixed by charging systems in CO, ATE and operating rooms;
- determination of charges for each subscriber using order forms or charge accounting data and existing rates;
- warning subscriber on charges to be payed;
- checking subscriber payments in time for the services provided;
- reception of payments from no-payers;
- analysis of subscriber claims on payments, provision of required information and charge reaccounting;
- creation and management of subscriber's and address card indexes.

16.3.2. Such operations as data acquisition, charge fixing, warning subscriber, checking payments, creation and management of subscriber's and address card indexes should be centralized and provided using data processing on zone computer centres.

Computer centres, which provide service charges data processing, should be equipped with EC or CM computers.

16.3.3. Reception of payments from no-payers, analysis of subscriber claims should be provided by special groups of operators, which are organized at telephone nodes in local telephone networks, district communications or urban communications nodes.

16.3.4. Computer-based data processing should include following procedures:

- reception and input to the computer of charge accounting data from CO, ATE and operating rooms (charge information for local, zone, toll and international talks), from district communications nodes and telephone

nodes (information on card indexes correction), from payments offices (information on paying bills), from the state Bank's offices (information on payment requirement);

- charging of toll and zone telephone talks, i.e. charge fixing for each talk;
- charge fixing for local telephone talks;
- separation of data flow on telephone talks by subscriber's classes (home, office, hotel, free);
- data accumulation for each subscriber within given period;
- transmission to hotels of information on zone and toll talks payments;
- creation and printing of bills;
- payments checking by comparing charges and payments data for each period;
- creation of lists for subscribers, having debls, to call them by phone and switching off telephone sets;
- creation and management of subscriber's and address card indexes;
- provision of statistics and accounting records;
- creation and management of primary and output data archives.

16.3.5. Primary data on provided services should be transmitted from ATE to computer centre by non-switched telephone channels.

Primary data on services should be provided from CO to computer centre by automatic collection and transmission of data from charge accounting equipment to data acquisition position of telephone node and then to computer centre by non-switched telephone channels.

Acquisition of data from charge accounting equipment in networks with no nodes should be provided on the special collection office. During the first stage of operation, the use of transportation facilities is allowed.

16.3.6. The directory data base should be created and up dated on the computer centre, containing subscribers and address card indexes. Data transmission for up dating card indexes should be carried by switched telegraph networks after charges have occured.

16.3.7. Charges for toll and zone telephone talks using centralized charge accounting equipment are defined by accumulated charges for all subscriber's talks within given period. Each talks charge is determined as a multiplication of talk duration in minutes to the rate. 5 copecks will be added to this product for home subscribers.

16.3.8. Charges for toll and zone telephone talks, when semiautomatic or manual connection is established, are defined by the talk duration, called zone's toll code and number of value-added services, which are fixed by the operator in оЖц-5 form or tape.

16.3.9. Charges by time for local talks are defined as a difference between charge accounting subscriber counter contents in the beginning and the end of settlement period.

16.3.10. The subscriber should receive a common bill for all PSTN's services within settlement period.

16.3.11. Residential subscribers' warning on fixed charges to be payed can be carried, using following payment docu ments:

- address notification account;
- printout (subscribers' debts list for each payment item).

16.3.12. Address notification accounts should be provided to each subscriber by mail no less then once in a month.

For home subscribers a notification account, which is used on network with local talks charged by time should contain following data:

- settlement period;
- notification number;
- date of writing out;
- directory, phone number;
- subscribers address;
- account number;
- phone;
- number of zone and toll talks for each phone and charges;
- total charge by zone and toll talks for all subscriber phones;
- UTN's subscription change;
- charges for telegrams, transmitted by phone, with the indication of their total number;
- charge for local telephone talks;
- total charge.

The notification account contains no data on local talks in networks, where there is no local talks charging by time.

If necessary, services charge to be payed can be decoded, the city, date, duration and charge being indicated.

The subscriber receives data on prepared account no later than a month after recording an account.

Residential subscribers should pay for the provided services no later than 15 days after issue of payments document.

Notification accounts should be payed in post offices or savings banks. The account marked as payed, should be returned to the subscriber, and notification should be left in the payments office.

16.3.13. Printouts should be provided to payments offices once a month. Printouts contain data on total charges by subscriber's phones, registered in this payments office.

Paying the bill, subscriber defines in printout the own phone, writes indicated charge to the payments document and pays it.

16.3.14. The payments document for office subscribers is a payment request, which should be sent to associated State Bank offices no less than two times a month. Payment requests should be payed in bank with no acceptance i.e. by transfering charges, which are indicated in payment requests, from enterprise's settlement account to the post office's one.

The payment request should contain following data:

- index of enterprise;
- date of document issue;
- name of enterprise (payer);
- name of payer;
- payer's settlement account number;
- code of banking operation;
- settlement period;
- ammount to be payed.

The settled accounts being payed should be sent from the bank to the post office, providing settlements.

16.3.15. Settlement with hotels should be carried in the same way, as with office subscribers (see 16.3.14.). It is necessary to provide an efficient transmission of charge accounting data from ATE and CO (in the case of charging local talks by time) to hotels. It is recommended to use telegraphs.

16.3.16. Checking of subscribers paying the bills should be carried, after a pre-defined period of time.

Payments checking is provided by company payments documents with notification of payments, received from payment position and State Bank's office. As a result of check, the list of subscribers, who have not payed accounts on time, is created. This list is used to warn subscribers about debts by phone. In five days after warning the second checking phase should be carried; the subscribers who have not settled debts are inscribed to the "switching off" list.

When a subscriber has claims on charges, he is to receive a new payments document with no disputable charges.

If the claim is unjustified, the associated charge is included to the payments document of next settlement period.

Accounting claims should be taken from subscribers within a month after issue of a payments document and analysed within a month.

16.3.17. Sending data on service payment from payment positions, which are situated in province, to computer centre is to be carried in two phases. The first is a delivery of payments documents or payment data tapes from payment positions to the node by transport facilities. The second is the data transmission to the computer centre, using data transmission lines.

The delivery of data on payments from payment positions in province should be carried directly to the computer centre by mail or transport facilities. The paid payment requests should be delivered from the State Bank offices to the computer centre by transport facilities, using a courier.

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