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TEL POLICY
RESEARCH AND DEVELOPMENT
(FOUO 12/80)

1 OF 1

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Worldwide Report

TELECOMMUNICATIONS POLICY,
RESEARCH AND DEVELOPMENT

(FOUO 12/80)



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WORLDWIDE REPORT
TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 12/80)

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JAPAN

JAPANESE WEATHER SATELLITE SENDS FAULTY DATA

OW161347 Tokyo MAINICHI DAILY NEWS in English 15 Oct 80 p 12

[Text] The unreliability of pictures sent from the Japanese weather satellite "Himawari" was causing the meteorological agency to make wrong predictions about the course of typhoon no. 19, it was found late Monday night.

The disclosure, which came as a great shock to the agency, was learned after 10 a.m. when data about the typhoon were sent from a U.S. observation plane.

The U.S. plane observed the typhoon near Yasushima Island at 9:39 p.m. but the location was some 40 kilometers away from the point set by the agency on the basis of pictures sent from the Himawari.

At that time, the typhoon was at a point very important for weathermen to predict whether it would hit Kyushu or not.

At that time, the agency was saying that the typhoon was likely to hit southern Kyushu. After it was found that the storm was actually located some 40 kilometers eastward, the agency quickly changed its forecast, saying that the storm would skirt the southern tip of Kyushu.

Together with the alteration of the prediction, the agency had also to revise the projected course of the typhoon it had earlier announced on the basis of Himawari's pictures received every three hours.

The revision demonstrated the lack of dependability on data sent from the weather satellite launched under great fanfare.

Shocked officials of the agency said that they would immediately start checking on the cause of the satellite's transmission of incorrect data.

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UGANDA

BRIEFS

FRG, AUSTRALIAN COMMUNICATIONS AID--Dr David Anyoti, Ugandan minister of information and broadcasting, recently appealed to the Federal Republic of Germany to provide maintenance for radio and television transmitters in the national system as well as for the UGANDA TIMES daily's teletypewriters. The request was accompanied by an appeal for scholarships, the possibility of having technical personnel trained in Germany and the supplying of educational and cultural publications and films. In addition, the Australian company Codan Pty concluded a \$160,000-contract with Uganda for the supplying of high-frequency radio equipment. [Text] [Paris MARCHES TROPICAUX ET MEDITERRANEENS in French 19 Sep 80 p 2305] 11,464

MUKONO GROUND STATION--The Mukono satellite communications ground station, 25 kilometers from Kampala, should be operational by December. The station cost \$20 million. Five circuits will connect Uganda with Italy, five with France, the United States and the Federal Republic of Germany and eleven with Great Britain. Ugandan officials have stated that the maximum capacity of the station will be 150 circuits. [Text] [Paris MARCHES TROPICAUX ET MEDITERRANEENS in French 26 Sep 80 p 2367] 11,464

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USSR

ELECTRICAL COMMUNICATION SYSTEMS, NETWORKS FOR 22ND SUMMER OLYMPICS

Moscow ELEKTROSVYAZ' in Russian No 6, 1980 pp 1-5

[Article by A. R. Zurman]

[Text] The entire world is tremendously interested in the events of the 22nd summer Olympic games, which, as is known, will be held for 15 days in July and August of 1980 in Moscow, in addition to Leningrad, Kiev, Minsk and Tallinn. The 80 Olympiad posed complex problems for organizers, in particular the problem of acquiring data transmission equipment. It was important to determine the right kinds and volumes of communications services, and then, during the construction of the communications network and Olympic facilities, to plan how to use them to the fullest extent during the days of the Olympiad and in the interest of the national economy of the country after the Olympics.

The volumes of communications services, the structure of the networks and the technical base of the communications facilities for serving Olympiad-80, were determined on the basis of requirements of the most complete fulfillment of requests of the following categories of consumers: a) the press: the "print" press, consisting of journalists, correspondents, representatives of news agencies, and the "electronic" press -- television and radio broadcast journalists, commentators; b) athletes and personnel servicing the games; c) games organizers -- the apparatus of the Olympiad-80 Organizing Committee, the Olympiad ASU, the sports facilities administration and other organizations participating in the preparation and carrying out of the games; d) spectators -- visitors of events at the sports facilities and of the cultural program; e) other consumers -- tourists, official guests, participants in associated sports-related events (meetings, congresses, etc.). The requirements of the mentioned consumers were different both in terms of the volume and kinds of communications services and in terms of the time and location of use. An analysis of all the conditions and experience in the organization of communications for previous Olympic games showed that the best approach is to offer separate communications services to each individual category of consumer (even within a given facility), using communications systems specifically intended for it.

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Accordingly separate communications systems were built at each Olympic sports facility for the spectators (communications offices and pay phones); the press (call points, press agents' telegraph rooms, TV monitors and telephones at the journalists' work places); TV and radio commentators (commentator booths and points in the stands equipped with communications channels and monitors); services and employees of the Organizing Committee, security, etc. (special telephone and dispatcher communications network). Both Soviet-made and imported equipment was used in the planning of the Olympiad-80 communications networks.

The makeup and capacity of the equipment were planned specifically for each facility in accordance with the number of spectator seats, commentator booths and press desks.

The main press center (GPTs), Olympic village, Olympic teleradio center (OTRTs), visitors' dormitories and places where the events of the cultural program were held are also equipped with the appropriate communications complexes (communications departments, call points, telegraph rooms, municipal and international pay phones and public address and synchronous translation systems).

Consumers will be offered the following electrical communications services in consideration of the conception explained above:

Municipal telephone communications:

- a) for the press -- telephones at desks at press centers and press loges and in commentators' suites. Telephones are hooked up to the Moscow ATS [Automated telephone exchange], and the journalists can use the set assigned to them for access both to the municipal and to the international networks (if they subscribe to that service);
- b) for contestants -- municipal telephones with Olympic village numbers and pay phones on the sites of the sports facilities;
- c) for games organizers -- municipal telephone at work places and in automobiles. Also, a special Olympic preferred telephone network (OVTS) with 3,000 abbreviated dial numbers was established for the Olympiad-80 Organizing Committee. This will assure reliable communications between Organizing Committee subdivisions, Olympic arenas and various Olympiad services;
- d) for spectators -- pay phones on the sites of the sports complexes and on city streets;
- e) for tourists and guests -- GTS [Municipal telephone exchange] telephones in hotels and campgrounds and pay phones in the cities and suburbs.

Municipal telephones were installed at Olympic sports facilities, in the Olympic village, Main press center, Olympic broadcast center and Olympiad-80

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Organizing Committee building at the expense of the capacity of five specially built Olympic ATS and of ATS constructed in accordance with development plans of the Moscow municipal telephone network.

The technical base is automatic switching equipment of the coordinate system of improved design (ATSKU). The Olympic ATS that serve GPTs, the Organizing Committee of Olympiad-80 and OTRTs are equipped with high traffic capacity group systems.

Long-distance and international telephone communications:

a) the press has call points at GPTs, closed to spectators (more than 100 booths) and at all press subcenters at the Olympic sports facilities (a total of more than 300 booths). International pay phone booths are also installed at the press center. From the MGTS [Long-distance telephone exchange] telephones set aside for accredited journalists (installed in press loges, at journalists' work places at press centers) a journalist can place direct international and long-distance calls. At their headquarters and apartment buildings main foreign press agencies will have at their disposal direct (unswitched) channels for communicating with their editorial offices;

b) games participants (athletes and service personnel) can make international long-distance calls from call points, set up in the Olympic village and in communications offices at the sports facilities;

c) games organizers can place necessary calls both from municipal telephones with access to international automatic (MN-ATS) and long-distance (AMTS) telephone exchanges, and on leased channels;

d) spectators, tourists and guests will use call points and pay phones at communications offices at the Olympic facilities, in hotels and on city streets.

All categories of consumers will have at their disposal 40 call stations with more than 500 booths, in addition to those that are operating only in Moscow.

Calculations of the anticipated load on the Moscow international telephone exchange during the Olympics revealed that the total number of channels on automated lines should not be less than 1,500, and the number of channels with manual service should not exceed 250. Therefore the previously planned automatic quasioelectronic international exchange was expanded and the existing switching equipment of the Moscow international exchange was used to the fullest extent possible.

Since the additional long-distance load (within the USSR) in connection with the holding of the Olympic games will be less than 10% of the total long-distance traffic, for which the Moscow AMTS were designed, no further

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expansion of the exchanges was planned. This also applies to the Leningrad, Kiev and Minsk AMTS. The construction of the Tallin AMTS, the capacity of which will include Olympic traffic, has been completed.

Telegraph and facsimile communications:

At the Main press center and at all press subcenters are installed "Infotek-6000" facsimile machines, manufactured in West Germany (about 140 units) for journalists. A network for collecting information from all press subcenters and for transmitting it through the USSR Central Telegraph office to editorial offices via "Telex," "Gentex," and other networks, was designed on the basis of this equipment. At the same time the equipment can be used for direct communications with the editorial offices of newspapers, journals and press agencies equipped with these machines.

In addition, at communications centers of the Main press center and press subcenters are installed teletype machines, connected to the "Telex" international network, for direct communications for journalists. "Telex" services will also be offered to Olympiad-80 Organizing Committee services, OTRTs administration and coordination services and hotel administrators.



The Olympic teleradio center (OTRTs); the Olympic switching center (OKTs) in the right background.

The "Telex" exchanges in Moscow will be expanded for connecting Olympiad subscribers to the "Telex" network and an AXB electronic switching

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exchange (manufactured in Sweden) with a capacity of 2,000 numbers will be installed at the USSR Central Telegraph office.

Public telegraph service will be provided for athletes, guests, spectators and tourists by a network of communications offices (stationary and mobile) in the Olympic village, at sports complexes, OTRTs, Main press center and on city streets.

The implementation of planned measures to provide Olympiad-80 with all necessary kinds of electrical communications (on a high technical and quality level) necessitated the construction of new communications lines and channels in addition to the outfitting of terminal stations or communications subdivisions, where these services are provided directly to consumers, and of centers (enterprises) of communications (ATS, AMTS, MN-ATS, "Telex" exchange). These networks consist of two major complexes:

data acquisition networks, connecting various consumer terminals with communications centers, basically in the city;

trunk and distribution networks, which send information (TV and radio programs, press records and reports) to client countries. These are most complex and expensive facilities.

A unique Olympiad-80 communications complex, conditionally called "External lines," or "Local communications" -- lines and channels for various purposes between Olympic facilities and communications centers, the TASS building, etc., has been constructed in Moscow. This project solved problems of the development of an economical complex network of lines and channels for the following: TV and radio broadcasting system; Olympiad ASU; operational communications systems of Olympiad-80 Organizing Committee; communications centers of the Main press center and press subcenters, TASS, special services; control system of the Olympiad-80 communications network.

Lines and channels of all these communications systems, serving Olympiad-80, will be distributed, they will be monitored, and the Olympic communications network will be managed at a single center -- the Olympic switching center (OKTs), which is nextdoor to OTRTs.

Aspects of the development of the first three networks as the most complex, important and unusual in Soviet practice, are examined below.

As is known, up to 20 TV channels, 100 audio commentator channels and 100 radio broadcast channels were organized from Moscow to the international network. The communications systems perform the collection of TV and radio broadcast information from all events and transmits this information to OTRTs, which produces the programs that go out into the international network.

For this purpose 56 city radio relay lines, operating in the 13 GHz range, are being set up in Moscow from the athletic facilities and along routes of

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competition. Each line contains one TV and four first-class audio channels. There is one radio relay station (RRS) to which programs are supplied within a sports complex (region) on coaxial cables, for each group of closely clustered sports facilities (sports complex). These RRS terminals are installed at the following locations: Luzhniki -- on 19 TV channels, on Prospekt Mira -- on 10, at TsSKA [not further identified] -- on 8, Krylatskiy -- on 5, "Dinamo" -- on 2 TV channels, Bittets -- on 3, Izmaylovo -- on 2 and in all other regions on one TV channel. All channels lead to the Olympic communications center.

The antennas of radio relay lines are installed on the roof of the OKTs building, and the equipment is on its 14th floor. From OKTs TV information in the video spectrum is fed through coaxial cables to the switchboard of the central equipment room of OTRTs, which simultaneously receives audio accompaniment -- intershum channels.

Also constructed is a network that supplies video information from OTRTs to 1,200 TV and radio commentator work places and 1,800 work places of journalists, honored guests and judges. These 3,000 TV sets will receive 12 programs from the air (six in the meter and six in the decimeter bands) and three Central TV programs, and individual kinds of contests in which the commentators are interested will be transmitted on the other nine TV channels. Additional transmitters and antennas for relaying these nine programs through the air are installed on the Ostankin television tower. Systems have been developed for combining up to six transmitters on one antenna. TV programs are distributed to all work places at all sports facilities through cable TV systems.

Organizing the simultaneous transmission of many commentator "triads," with which each commentator booth is equipped, posed the greatest difficulty during the planning of the TV and radio broadcast system. A "triad" includes the following components: direct commentator channel, meeting the requirements on class II channels in accordance with GOST 11515-75; return communications line to the commentators; two-wire service communications, satisfying the requirements on the standard telephone channel.

Not less than half the total number of commentator triads from the Moscow sports complexes (more than 1,200, including about 400 from Luzhniki, 300 from Prospekt Mira, 150 from Krylatskiy, 100 from TsSKA and 50 from "Dinamo") had to have wide-band direct commentator channels.

During the development of different versions of the organization of large wide-band channel trunks it was recommended that IKM [pulse-code modulation] systems and digital broadcasting equipment (OTsV) be used. This equipment was developed specifically for Olympiad-80 and was adopted by Minpromsvyaz' [Ministry of Communications Industry] enterprises in an unprecedentedly short time. The equipment provides eight class II broadcast channels in a standard 2,048K bits/s digital circuit, for example of the IKM-30 system.

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The adoption of IKM-30 and OTsV by the TV and radio broadcast networks made it possible to unify to a great extent decisions on the organization of channels, both in this system, and in communications networks of the Olympiad ASU and Olympiad-80 Organizing Committee.

Direct commentator channels with a 300-3,400 Hz band ("narrow"), the return and two-wire communications channels of the commentator triads, the four-wire register communications complexes, central synchronization channels and other channels are organized on the basis of standard IKM-30 channels.

Also set up on IKM-30 channels are channels for transmitting data from terminal systems installed in Olympic facilities, to the computer of the Main information-computer center (GIVTs) of the Olympiad ASU and regional computer centers, connecting lines between the main coordination control center and regional control points of the Olympiad-80 Organizing Committee.

These decisions led to the construction in Moscow of an economical complex network of communications lines and channels for various customers on the basis of type "T" telephone cables.

The terminal equipment is installed in line-equipment shops (LATs) at sports facilities, at GIVTs, Olympic village and Main press center. Each group of proximate sports facilities (just as in the case with RRL) has one LATs.

The "External lines" LATs at OKTs receives information and distributes it to the recipients. The commentator triads, service communications and central synchronization channels (in all there are more than 4,500 channels, including about 800 wide-band channels) in the low-frequency spectrum are supplied through connecting cables to the appropriate OTRTs control rooms. Data transmission and service channels (about 300) are switched at GIVTs of the Olympiad-80 ASU (four-wire retransmission). The operational communications channels (more than 100) of the Olympiad-80 Organizing Committee are connected to the Olympiad coordination control center.

Each LATs at an Olympic facility is connected to OKTs by at least two routes, and the largest, for example Luzhniki, by 3-4 lines; all major trunks of the IKM-30 system are equipped with backup line channels.

In all about 250 IKM-30 and OTsV systems have been installed for generating channels from all Olympiad facilities.

The line circuits were routed so as to pass through ATS that will assure the maximum utilization of the IKM systems after the end of the Olympic games for the purpose of center to center and station to station communications in Moscow GTS.

It is noteworthy that operational dispatcher communications of the Olympic communications control center and service channels of LATs technical personnel and RRL terminals are also organized on IKM-30 channels.

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A complex network of direct wires on type "T" cables was developed for phone booths of the Main press center and press subcenters, and DATA-3, DATA-6 and TVU-12M telegraph channeling equipment is used extensively.

The line facilities both for the IKM systems and for direct wires were designed to make maximum utilization of existing cables and MGTS telephone channeling equipment. The route was planned in consideration of all planned networks in the event it becomes necessary to construct new lines. About 1,000 channel-kilometers of telephone lines were installed in Moscow for these purposes.

We have examined the complex of installations for collecting, monitoring and distributing all kinds of information and for connecting Olympic facilities along with their subscriber installations to communications centers.

The basic decisions regarding the organization of the complex of trunk lines for transmitting the generated information to foreign consumers are discussed briefly below. For this purpose a number of radio relay and cable trunks were reconstructed and refitted, new space communications relay stations were built and existing ones were expanded. They are outfitted with the newest equipment, the quality characteristics of which meet foreign standards.

Problems related to the organization of large wide-band radio broadcasting trunks on international routes were solved during the development of the network; in particular, the use of MST-15 (West Germany) equipment enables most countries to receive radio broadcast programs with the existing inventory of equipment.

And so, the Olympic electrical communications complex described herein, intended for TV and radio retransmission from the games of the 22nd Olympiad, for equipping press representatives, athletes, guests and tourists with all modern means of acquiring and transmitting information and for managing the Olympic games and associated activities, is a complex combination of newly introduced and existing communications systems and equipment.

Much attention was devoted to aspects of the reliable functioning and interaction of centers and enterprises of various sectors of the USSR Ministry of Communications, among themselves and with services of the Olympiad-80 Organizing Committee, USSR Gosteleradio and Olympiad ASU.

A special control system was developed for the complex Olympic communications network, including the following subsystems: communications network operations management; automatic monitor and display of the performance of communications equipment; acquisition, transmission and electronic processing of information about the preferred communications services.

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Control is accomplished with systems installed in the control center at OKTs: command dispatcher communications complex and GATS and OVTS telephone networks; programmable computer and systems for monitoring and displaying the condition of group channels, TV and radio broadcasting channels; programmable computer for the acquisition, processing and analysis of information about communications services.

The electrical communications systems of Olympiad-80 were certified in the summer of 1979 during the final meets of the 7th Summer Spartakiad of the Soviet nations. The equipment was installed at the Olympic facilities of Moscow and 16 video and intershum channels, 1968 commentator triads (including 146 on digital broadcast equipment), 136 ASU channels, more than 100 technical communications and central synchronization channels, etc., were organized on the "Olympic Plan." Communications centers of the Main press center and 19 press subcenters were outfitted.

The performance of the electrical communications system confirmed the validity of the engineering decisions that were made.

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USSR

TELEVISION, RADIO BROADCASTING AND RADIO COMMUNICATIONS AT OLYMPIAD-80

Moscow ELEKTROSVYAZ' in Russian No 6, 1980 pp 6-17

[Article by M. A. Shkud]

[Text] The development of human culture, multilateral cooperation among countries and, finally, athletics entails a broadening of the scope of the Olympic games. Whereas tens of thousands of people used to go to the games, hundreds of thousands of spectators are expected to come to Moscow to witness the 1980 games. The scope of this event is also determined by the fact that modern communications and TV systems enable more than 2 billion inhabitants of our planet to witness the events of the games in Moscow, and radio broadcasting systems inform the whole human race about them.

Realization of the technical capabilities of television, radio broadcasting and communications systems to transmit information to the entire world was one of the main tasks during organization of the Olympic games in Moscow. Because Olympiad-80 was the first such event to be held in a socialist country it was particularly important to take a careful approach to the choice of all technical systems, determination of the volumes of all kinds of communications services and training of servicing personnel.

What kinds of TV, broadcasting and radio communications systems will be used for serving the 22nd Olympic games?

The Olympic events for which it is necessary to organize the transmission of TV and radio broadcast information will be held in Moscow at 32 locations; sailing events will be held in Tallinn, some of the soccer games will be played in Leningrad, Kiev and Minsk, track and field events, heavy athletics, boxing, wrestling and other events must be shown simultaneously from several places differentially, depending either on the kinds of competition (rings, parallel beams, uneven bars, etc.), or on the categories of the contestants (for example, weight categories). Certain foreign companies will produce their own programs for individual kinds of sports.

The technical capabilities for simultaneous broadcasting of transmissions of 67 events, 62 of them about the games, and two from the Main press

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center and Olympic village, were created in consideration of the requirements mentioned above. As a whole, however, systems were installed for transmission from 102 locations. Since some events last only 1-2 days, these 102 locations are equipped with 88 mobile TV stations because of the need to rebase the equipment.

During the days of the Olympiad cultural events, which will be organized for participants and guests of Olympiad-80, and various meetings (at railroad stations, airports and city squares) will also be broadcast. Existing equipment of the Television technical center (TTTs) imeni the 50th Anniversary of October will be utilized for these transmissions; three such programs will be produced.

The Olympic complex of technical systems, intended for solving the above-mentioned problems, was developed jointly by USSR Gosteleradio and the USSR Ministry of Communications. USSR Gosteleradio set up on Ul. Koroleva (in Ostankin), across the street from TTTs, the Olympic teleradio center (OTRTs), equipped all sports facilities with TV and radio broadcasting systems. The USSR Ministry of Communications constructed all the communications lines for that complex and the Olympic switching center (OKTs) (also in Ostankin) for switching communications and monitor channels.

The blueprint of this extremely complex and large system was approved in 1976, and its installation was completed in 1979. The tuning and testing of the system showed that the equipment would serve the 22nd Olympic games on a high technical level and offer great conveniences and capabilities.

In 1968 satellite communications systems provided extensive coverage of the Olympic games in Mexico, not only in North America, but in Europe and Asia as well. An attempt was made in Mexico to produce a single worldwide program for televising the Olympic games, which was supposed to meet the requirements and interests of all TV organizations around the world. However, such a program actually was not produced by many television companies: the American television companies, using the greatest volume of technical systems for showing the games, influenced the Mexican national Olympic committee, and the program essentially reflected basically the tastes of American television and was specialized in the showing of American athletes. But the participation of the athletes of other countries was by no means adequately reflected.

This condition was corrected to some extent during organization of the 1972 summer Olympic games in Munich, and in addition to a unified worldwide program television organizations had an opportunity to transmit their own programs to their own countries; 12 international programs were relayed from Munich. But the 3-4 channels allocated to "Intervideniye" were not enough to satisfy various sporting interests, and the problem was even more acute for "Eurovision," since that system includes a large number of countries. The analogous situation arose during the 1976 Olympic games in Montreal, where 10 consolidated programs were produced for the different television companies.

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To meet the demands of the TV companies around the world technical systems were constructed in Moscow, which will enable them to transmit from the 1980 Olympic games 20 international programs -- 14 by satellite link and 6 by landline, radio relay and cable links. In addition, the program of the Soviet Union television (TSS) will be broadcast to European countries by landline and to countries of the Orient by one satellite channel.

The plan of broadcasting of TV programs of Olympiad-80 by the international network is shown in Figure 1. Twenty TV channels are distributed and organized as follows: seven channels are allocated to "Eurovision," two through an AO-3 satellite of the "Intelsat" system over the Atlantic Ocean, two by Moscow-Tallinn-Helsinki landlines and three through a "Statsionar-4" satellite of the "Intersputnik" system above the Atlantic Ocean to ground satellite stations in Bulgaria, Hungary, Czechoslovakia and from there by landline to "Eurovision" countries; four landline channels go to countries of the "Intervideniye" system -- to Warsaw, Bucharest-Sofia, Budapest and Prague; two "Statsionar-4" satellite channels are used for transmitting the consolidated "Intervideniye" program and for the GDR program; two channels are kept in reserve -- one through the AO-1 satellite and one through the AO-3 satellite; one channel is set aside for Canada through the AO-3 satellite; one channel for Latin American countries and Africa through the AO-1 satellite of the "Intelsat" system over the Atlantic Ocean; two channels through an IO satellite of the "Intelsat" system over the Indian Ocean for Japan and Australia; one channel through a "Statsionar-5" satellite over the Indian Ocean for Eastern countries (Mongolia, Vietnam, Afghanistan, Laos).

The Soviet TV (TSS) program will be transmitted by the Moscow-L'vov-Katovitse-Prague landline for European countries and through the "Statsionar-5" satellite for countries of the Orient. With the international network set up in this fashion the socialist countries of Europe will be able to receive simultaneously the consolidated "Intervideniye" program, their own program and the TSS program.

TV transmissions on the above-mentioned 20 international channels can be used by other countries with the appropriate audio commentary in their own languages, and therefore there are not 20 lines for audio accompaniment, but 100 on satellite channels and landlines.

A total of 100 radio broadcast programs will also be made available to the international network.

The transmission of such a large number of international TV and radio programs requires a large number of service communications channels, more about which will be said below.

To accomplish the transmissions the USSR Ministry of Communications constructed several new facilities and reconstructed some existing ones. In Dubna, near Moscow, is a new ground satellite communications station,

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KEY to Figure 1:

- | | | |
|--------------------------------|----------------------------|---|
| 1. Cuba | 37. Algiers | 71. Minsk |
| 2. Mongolian People's Republic | 38. Eurovision | 72. Korneshty |
| 3. North America | 39. North America | 73. Kovrov |
| 4. Latin America | 40. Canada | 74. Conventional designations: |
| 5. Africa | 41. Mongolia, Afghanistan | 75. Connecting lines |
| 6. Copenhagen | 42. TSS | 76. Number of channel in satellite communication system |
| 7. Stockholm | 43. Bulgaria -- Eurovision | 77. Prague |
| 8. Frankfurt am Main | 44. Hungary -- Eurovision | 78. TV program switching center |
| 9. Hamburg | 45. CSSR -- Eurovision | 79. TSS [TCC] -- Soviet Union Television |
| 10. Helsinki | 46. Intervideniye and Cuba | 80. URS [YPC] -- Central radio relay station |
| 11. Eurovision | 47. GDR | 81. Afghanistan |
| 12. Brussels | 48. Japan | 82. Munich |
| 13. Berlin | 49. Intelsat AO-1 | [OPTC=ORPS; OHL=OKTs] |
| 14. Paris | 50. Statsionar-5 | |
| 15. Lodz | 51. Intelsat AO-3 | |
| 16. Warsaw | 52. Intelsat IO | |
| 17. Bratislava | 53. Statsionar-4 | |
| 18. Katovitse | 54. "L'vov" | |
| 19. Geneva | 55. "Dubna" | |
| 20. Zurich | 56. "Moscow" | |
| 21. Koshitse | 57. "Vladimir" | |
| 22. Prague | 58. Eurovision | |
| 23. Vienna | 59. Tallin | |
| 24. Shapron | 60. Leningrad | |
| 25. Emed | 61. Eurovision | |
| 26. Budapest | 62. L'vov | |
| 27. Pec | 63. Kiev | |
| 28. Zagreb | 64. Moscow | |
| 29. Kei | 65. Czechoslovakia | |
| 30. Bucharest | 66. Uzhgorod | |
| 31. Yashi | 67. Hungary | |
| 32. Milan | 68. Poland | |
| 33. Rome | 69. Brest | |
| 34. Madrid | 70. Bulgarian SSR | |
| 35. Sofia | | |
| 36. Turkey | | |
| Greece | | |

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Table to Figure 1

OKTs channel number	Destination	OKTs channel number	Destination
1	Poland	12	GDR
2	Bulgarian SSR	13	Czechoslovakia --
3	Hungary		Eurovision
4	Czechoslovakia	14	Intervideniye and Cuba
5	Latin America, Africa	15	Eurovision
6	North America	16	Bulgaria -- Eurovision
7	Eurovision	17	Hungary -- Eurovision
8	Eurovision	18	Japan
9	North America	19	Australia
10	Canada	20	Eurovision
11	Mongolian People's Republic, Afghanistan		

where equipment is installed for transmitting four programs through a satellite of the "Intelsat" system over the Atlantic Ocean and for transmitting two programs through a "Stacionar-5" satellite of the "Intersputnik" system. The facility has one 32-meter diameter antenna and one 12-meter antenna. The facility is connected to Moscow by a radio relay line. A new building and a 25-meter antenna were erected at an existing ground station near Vladimir; equipment was installed for transmitting five TV programs through a "Stacionar-4" satellite of the "Intersputnik" system over the Atlantic Ocean and radio relay lines were installed from Moscow. Additional equipment was installed at a ground station near L'vov for transmitting a second TV program through a satellite of the "Intelsat" system over the Atlantic Ocean. Additional equipment for transmitting two TV programs through a satellite of the "Intelsat" system over the Indian Ocean was also installed at a ground station near Moscow.

A new Moscow-Kiev-L'vov-Gosgranitsa radio relay line was built, through which are transmitted five TV programs -- three for European countries and two to the "L'vov" ground station. A Moscow-Yaroslavl'-Leningrad radio relay line was constructed and the existing Moscow-Leningrad and Moscow-Minsk-Pribaltika lines were reconstructed; these lines are connected to the Tallinn-Helsinki line and Olympic programs will be transmitted from Tallin and Leningrad. The Moscow-Minsk coaxial cable with one outlet to Europe was extended. The Olympic program will be transmitted from Minsk and there are audio channels to the European network. It should also be borne in mind that the Soviet Union network near Vladivostok is connected to the Korean People's Democratic Republic network, and in Azerbaijan it extends to the border of Iran, which, if properly matched, will permit the transmission there of the Soviet Union television program.

All the technical systems of Gosteleradio, intended for the production of Olympic programs, can be divided into two main groups:

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1) systems, both stationary and mobile, installed at athletic facilities and other Olympic facilities and henceforth called "site" systems;

2) stationary systems installed in the special OTRTs building, intended for the production, recording, switching and technical monitoring of TV and radio broadcast programs by foreign companies.

All the technical systems of the USSR Ministry of Communications, intended for channeling Olympic programs, can be divided into the following groups:

radio relay lines for transmitting TV programs from the locations of the events to OKTs;

cable lines for organizing commentator and service channels from the sites to OKTs;

cable lines between OKTs and OTRTs for transmitting and receiving video and audio information;

radio relay and cable lines for receiving programs from other cities;

ground satellite communications stations, radio relay and cable lines for transmitting programs to other countries around the world;

the Olympic switching center, which performs switching, monitoring and transmission to OTRTs of all video and audio channels and receives programs from OTRTs for transmission to all countries;

TV transmitters, installed on Ostankin tower (ORPS) for transmitting information to Moscow sports facilities.

Site TV systems are equipped with mobile TV stations (PTS), the cameras of which are installed on special platforms, to which are laid camera cables. Cables are hooked up in exactly the same way to intershum microphones, mounted in the stands. Each PTS produces its own program and sends it by cable to the technical TV control room (TTA) of the sports facility, where the program is monitored and sent to the radio relay line control room for transmission to OKTs and control room of the internal TV and audio network (AVTZS). Information from the Olympiad ASU system is transmitted into the same network. Signals from the scoreboard and timing system go to PTS.

Commentator positions (1,286 compared with approximately 700 at the preceding Olympiad) are either open-air in the stands, or are enclosed in the form of booths. Each television and radio announcer will have the use of a "triad" -- three channels that go to the telecenter: a direct commentator channel for transmitting commentary from the commentator's microphone, a return channel for monitoring and a service communications channel. At the work position (Figure 2) are installed, in addition to the announcer's microphone, systems for calling the telecenter, for listening to the return

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channel, for adjusting the level and for switching, and also two color TV monitors, which receive programs by cable from the main station of the AVTZS system. The main station receives by air three Moscow programs on channels 1, 3 and 11 and nine information programs on channels 5, 6, 8, 21, 24, 27, 34, 37 and 40. There are six meter band antennas (a separate antenna for each channel) and two decimeter band antennas -- three channels per antenna, for receiving. The antennas have a gain of about 20 dB, and by combining the antennas in different ways it is possible to find the location of optimum reception for each channel and to achieve high picture quality.

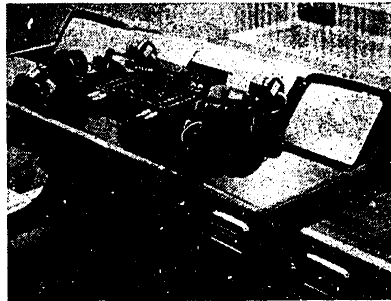


Figure 2.

In addition to these 12 information programs, received from the air, a commentator's position should receive from TTA programs produced at a given sports complex and information from the ASU system. The number of programs sent to a commentator at each facility is listed in Table 1 and varies from 14 to 26.

Programs from the main station of AVTZS are transmitted to commentator positions by cable in the 40-300 MHz band; channels organized by air are converted to other frequencies, and transmitters operating on cable are installed for programs incorporated in the AVTZS system. All programs are transmitted to an announcer's work place on one cable. A switching system converts any channel to the frequency of the second TV channel.

At the telecenter programs are supplied to transmitters by the information program dispatcher control room (ADIP), and at the sports complex programs are fed to the transmitters by the TTA duty officer. The transmission of information programs must be scheduled in advance.

The same information will be supplied to the journalists' work places, where one television set is installed for each journalist. Television

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sets from the AVTZS network will also be installed at the seats of honored guests, in the judges' chambers, restrooms and other places.

The meter band transmitters operate on common antennas with the powerful Moscow program transmitters; a separate directional antenna is installed for six decimeter transmitters. Matching systems were developed and manufactured to enable several transmitters to operate on the same antenna. Equipment of the cable TV system is used for sending programs from AVTZS to announcers and journalists.

This method of distributing information programs permits extremely economical servicing of many commentators and journalists with a large volume of information. The idea of the method was conceived by specialists of the USSR Ministry of Communications and adopted after the technical systems of Olympiad-80 were approved.

The OTRTs building has an internal information TV cable network (VTZS) for 400 subscribers, in which 24 programs, selected at the central control room (ATs) of OTRTs, are supplied from the VTZS control room.

If an announcer takes part in program production the program director in the program control unit (APB) sends to the announcer's work place in addition to the return low frequency (ONCh) in the triad, another ONCh for the outgoing program, which the announcer, who has the script of the program, can find out when to start his participation in the program. In some cases the announcer needs not only the ONCh, but also a picture of the formed program; it is transmitted on one of the information video channels.

The number of mobile stations and communications channels that take part in the production of Olympic programs is indicated in Table 1.

A structural diagram of the routes of video channels from the TV chamber and of announcer channels from the microphone to the international network and other consumers is presented in Figure 3. Service channels are not shown, but their routing is similar to that of the commentator channels, and the number is indicated in Table 1.

Programs produced by mobile TV stations (PTS) are transmitted to a semi-stationary transit point (PSTP) and from there through TTA to the radio relay transmitting room of the sports facility and by radio relay links in the 13 GHz band to the radio relay receiving station, housed on the 14th floor of the OKTs building; the antennas of these lines are installed on the roof of the building. Equipment for 51 TV channels is mounted in the equipment room of that station. The equipment for five radio relay lines, which transmit programs from the city streets on which the marathon and walking races will be held, from Minskoye shosse during the bicycle races, and from Olympic village and Main press center, is housed in the long-distance radio relay room in the Ostankin tower (ORPS); transmission

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Table 1

1)	2) 4)	3) Мест			7)	8)	9)	10)	11)	12)	13)	14)
		5) ТВ	6) РВ	комментаторов								
Центральный стадион им. В. И. Ленина в Лужниках	16) Большой спортивная арена	17) Открытие зимних Олимпийских игр, футбол, легкая атлетика, конный спорт	92	84	451	26	8	9	176	18	8	50
15)	Дворец спорта	19) Гимнастика, дзюдо	70	80	111	26	6	6	130	18	6	37
20)	Малая спортивная арена	21) Волейбол	17	16	38	26	2	2	33	18	1	13
22)	Универсальный зал «Дружба»	23) То же	18	12	21	26	1	1	30	18	1	10
24)	Плавающий бассейн	25) Водное поло	11	11	25	26	2	3	22	18	1	11
26)	Крытый спортзал № 1	27) Баскетбол	43	36	67	20	3	4	80	—	3	24
		28) Бокс	42	36	67	20	2	2	79	18	2	21
	Бассейн № 2	31) Водное поло, плавание, пятиборье	57	48	94	20	3	4	105	18	3	29
		32) Прямая в воду	17	16	32	20	2	2	33	—	2	13
35)	Гребной канал «Крылатское»	36) Академическая гребля, на байдарках и каноэ	36	36	93	16	2	4	72	18	1	19
		38) Крытый велодром	26	24	71	16	3	3	80	18	2	19
	40) Велодром	39) То же	16	12	—	—	1*	3	28	—	1	10
41)	Поле для стрельбы из лука	42) Стрельба из лука	—	—	—	—	1*	1	—	—	1	2
43)	Малая спортарена ЦСК А	44) Бильярд	17	16	45	21	4	4	33	18	3	18
		45) Фехтование	17	16	44	21	2	2	33	—	2	15
	48) Дворец спорта	49) Баскетбол	17	16	34	21	2	2	33	18	1	13
50)	Малая спортарена	52) Хоккей на траве	6	11	10	17	1	1	17	18	1	8
		53) Футбол, хоккей на траве	16	16	23	17	1	2	32	18	1	12
55)	Крытый зал в Хайки	56) Ручной мяч	12	12	25	14	1	1	24	18	1	10

[KEY on next page]

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KEY to Table 1:

- | | |
|--|-----------------------------|
| 1. Locations of TV and radio broadcast relay | 40. Bicycle rink |
| 2. Kinds of athletic activities and events | 41. Archery field |
| 3. Work places | 42. Archery |
| 4. Commentators | 43. TsSKA sports complex |
| 5. TV | 44. Arena No. 1 |
| 6. Radio broadcast | 45. Wrestling |
| 7. Journalists and guests | 46. Arena No. 2 |
| 8. AVTZS programs | 47. Fencing |
| 9. TV channels | 48. Field house |
| 10. Number of PTS | 49. Basketball |
| 11. Commentators' triads | 50. "Dinamo" sports complex |
| 12. Low-frequency return channels | 51. Small sports arena |
| 13. Centralized synchronization channels | 52. Field hockey |
| 14. Four-wire service communications channels | 53. Grand sports arena |
| 15. Central stadium imeni V. I. Lenin in Luzhniki | 54. Soccer, field hockey |
| 16. Grand sports arena | 55. Khimki field house |
| 17. Opening and closing of Olympiad-80, soccer, field and track, equestrian events | 56. Handball |
| 18. Athletic hall | |
| 19. Gymnastics, judo | |
| 20. Small sports arena | |
| 21. Volleyball | |
| 22. "Druzhba" gymnasium | |
| 23. Same | |
| 24. Swimming pool | |
| 25. Water polo | |
| 26. "Olympic" stadium on pr. Mira | |
| 27. Field house No. 1 | |
| 28. Basketball | |
| 29. Field house No. 2 | |
| 30. Boxing | |
| 31. Pool No. 1 | |
| 32. Water polo, swimming, pentathlon | |
| 33. Pool No. 2 | |
| 34. Diving | |
| 35. "Krylatskoye" sports complex | |
| 36. Rowing canal | |
| 37. Academic rowing, kayaking and canoeing | |
| 38. Indoor bicycle track | |
| 39. Bicycling | |

[Table continued on next page]

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Table 1 (continued)

1) Места трансляции телевидения и радиовещания	2) Виды спорта, мероприятия	3) Мест комментаторов			7) Журналисты и гости	8) Программы АРТЭС	9) Каналов ТВ	10) Количество ПТС	11) Количество коротких трид	Продолжение табл. 1		
		5) ТВ	6) РВ	12) Каналов обратной связи частоты						13) Каналов централизованной связи хронизации	14) 4-проводных радиотелефонной связи	
Конно-спортивная база в Битце	58) Конный спорт	17	16	31	14	1	1	33	18	3	22	
	59) Конное											
	60) Конкурное	16	16	88	14	1	1	32				
	61) Стиплчейз-ный круг	»	-	-	-	1*	1	-	-	1	-	
	62) Трасса конного спорта	»	-	-	-	-	1*	3	-	-	1	-
Крытый зал «Сокольники»	63) Трасса легковатического кросса	»	-	-	-	1	3	-	-	1	-	
	64) Кросс	-	-	-	-	1	3	-	-	1	-	
65) Крытый зал «Сокольники»	66) Ручной мяч	18	12	39	14	1	1	30	18	1	11	
67) Крытый зал «Измайлово»	68) Тяжелая атлетика	22	22	49	14	2	2	44	18	2	16	
69) Стадион Юных пионеров	70) Хоккей на траве	6	10	6	14	1	1	16	18	1	9	
71) Минское шоссе	72) Велогонка	14	10	-	-	1*	1	24	18	1	9	
73) Улицы города	74) Марафонский бег	-	-	-	-	3	4	-	-	3	6	
	75) Ходьба 20 км, 30 км	-	-	-	-	3	4	-	-	3	6	
76) Таллин	77) Регата	18	4	-	-	1	2	20	-	1	5	
78) Киев	79) Футбол	10	10	-	-	1	1	20	-	1	5	
80) Минск	»	10	10	-	-	1	1	20	-	1	5	
81) Ленинград	»	10	10	-	-	1	2	20	-	1	5	
82) Главный пресс-центр	83) Пресс-конференция	8	6	209	-	1	1	14	-	1	9	
84) Олимпийская деревня	85) Культурные мероприятия и пр.	4	2	-	-	1	2	6	-	1	2	

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KEY to Table 1 (continued)

57. Bitets equestrian base	73. City streets
58. Equestrian events	74. Marathon
59. Riding events	75. 20 km, 50 km walks
60. Game field	76. Tallinn
61. Steeplechase track	77. Regatta
62. Riding track	78. Kiev
63. Field and track arena	79. Soccer
64. Cross country	80. Minsk
65. "Sokol'niki" field house	81. Leningrad
66. Handball	82. Main press center
67. "Izmaylovo" field house	83. Press conference
68. Heavy athletics	84. Olympic village
69. Young pioneers' stadium	85. Cultural events, etc.
70. Field hockey	
71. Minskoye shosse	*Channels utilized repeatedly.
72. Cycle races	

from those places requires installation of antennas substantially higher than the OKTs building.

The program of the games that will be held in Tallinn, Leningrad and Kiev will also be transmitted via long-distance RRL, and from Minsk by cable through the radio relay equipment at ORPS, whence all TV channels are fed to OKTs by cable. There are backup channels for each line. Visual monitoring of the lines is incorporated in the RRL equipment rooms.

Every six commentators' work places are served by one technician's console. The consoles are installed in special technicians' booths. The communications channels from the commentators' work places are connected through the technicians' consoles to the technical communications room (TAS), where amplifiers are installed and these channels are monitored. From TAS the channels go to LATs of the USSR Ministry of Communications.

Digital communications equipment, by means of which the commentator and service channels are generated, and the equipment for monitoring the channels are installed in LATs. In addition, approximately 20% of the commentator channels are organized on subcarrier radio relay lines and shielded cable pairs. All cables from locations of events go to a cross-over network at OKTs and from there to the second floor of the OKTs building, where the LATs of local communications, i.e., of channels for communicating with the places where the Olympic programs are retransmitted, is located. Audio channels, organized on radio relay lines, also go to LATs from the terminal equipment of these lines, located on the 14th floor of OKTs.

Channels from commentators in Tallinn, Kiev, Minsk and Leningrad, which go to the long-distance communications LATs on the third floor of OKTs, are

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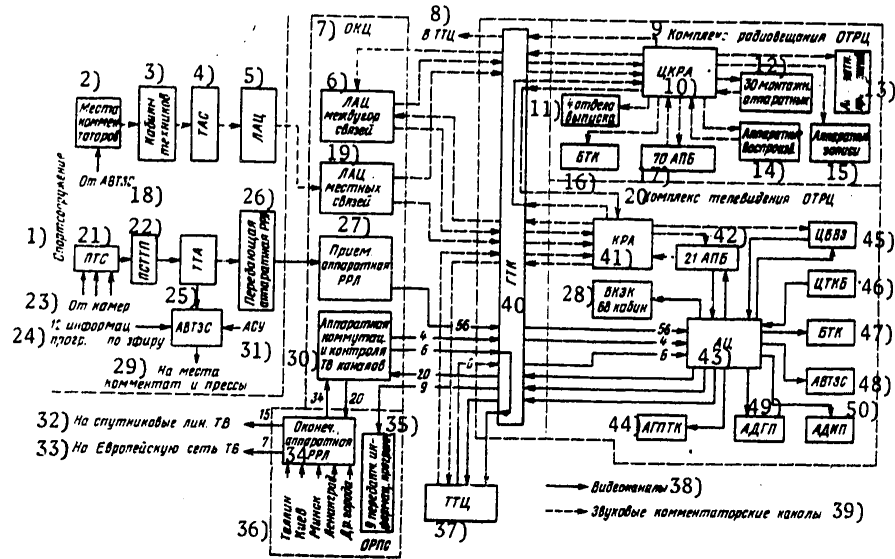


Figure 3.

- | | | |
|--------------------------------------|---|--------------------|
| 1. Sports facility | 25. AVTZS | broadcasting rooms |
| 2. Commentators' work places | 26. Radio relay transmitting room | |
| 3. Technicians' booths | 27. Radio relay receiving room | |
| 4. TAS | 28. BKEK 68 booths | |
| 5. LATs | 29. To commentators' and press representatives' work places | |
| 6. Long-distance communications LATs | 30. TV channel switching and monitor room | |
| 7. OKTs | 31. ASU | |
| 8. To TTTs | 32. To TV satellite links | |
| 9. OTRTs radio broadcasting complex | 33. To European TV network | |
| 10. TsKRA | 34. Radio relay terminal room | |
| 11. 4 production departments | 35. 9 information program transmitters | |
| 12. 30 wiring rooms | 36. Tallinn Kiev Minsk Leningrad Other cities | |
| 13. Audio room | 37. TTTs | |
| 14. Reproduction room | 38. Video channels | |
| 15. Recording rooms | 39. Audio commentator channels | |
| 16. BTK | 40. GTK | 46. TsTKB |
| 17. 70 APB | 41. KRA | 47. BTK |
| 18. From AVTZS | 42. 21 APB | 48. AVTZS |
| 19. Local communications LATs | 43. ATs | 49. ADGP |
| 20. OTRTs TV complex | 44. AGPTK | 50. ADIP |
| 21. PTS | 45. TsBVZ | |
| 22. PSTTP | | |
| 23. From rooms | | |
| 24. 12 information program | | |

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also fed to the local communications LATs. In the latter are installed 184 digital communications systems -- IKM-30 (30 IKM channels each), 72 digital broadcast systems with eight channels each and amplifiers for 80 shielded cable pairs. All channels pass through monitor racks, where the quality of the channels is monitored.

The work places at OKTs and OTRTs are divided among the TV and radio broadcasting services and sports facilities and have loudspeaker service communications with the LATs of the sports facilities and with the corresponding work places of the TV switching and distribution room (KRA) and central radio broadcasting switching and distribution room (TsKRA) of OTRTs.

From OKTs the communications channels are fed by cables, installed in a collector that connects both buildings, to the main technological cross-over (GTK) of OTRTs, from which 694 TV commentator triads, 360 ONCh channels and 440 quad service communications channels are fed to KRA, and 612 radio broadcast commentator triads and corresponding service channels to TsKRA. The audio channels are switched to the consumers at KRA and TsKRA by means of six-wire patch cords, which makes it possible to switch a triad with a single patch cord. In the channels are installed amplifiers with a high-impedance input and a low-impedance output. In the KRA and TsKRA racks the channels can be monitored and service loudspeaker communications can be conducted with LATs of OKTs and TAS of a sports facility.

The TV and radio broadcasting equipment of OTRTs can be used for performing the following kinds of operations connected with the preparation, production and transmission through OKTs of international programs:

direct reporting from the locations of Olympic events;

recording and playback of video signals, audio accompaniment and commentators' text, arriving from the locations of events; assembly and circulation of recording materials;

production in the programming units of national programs using direct reports from sports facilities and studio clips, prerecorded on magnetic tape or film;

reports from special commentator booths in caption form on the kinescope screen, transmitted from sports facilities, or from video tape, which is an independent program or a part of a program, produced at APB; there are 68 of these booths, and they are located in the BKEK unit;

processing and circulation of film materials of TV companies;

switching of signals from any of 165 external and internal sources to any of 352 consumers to assure the completion of the above-described kinds of operations and feedout of programs through OKTs to the international network;

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supervision of program production at the locations of events and of their utilization at OTRTs in terms of destination and delivery to the international network.

The OTRTs equipment provides extensive opportunities for program production: smooth mixing, the utilization of special effects, electronic reprojection, the insertion of cues and printed captions and slow motion replay of events. Automatic video level stabilization and selective automated monitoring of video signal parameters on 35 channels (using the technical monitoring unit BTK) are incorporated.

The equipment of the TV complex of OTRTs includes the following: 15 APB (Figure 4), consisting of studios, technical and program director's rooms and telekineprojection room. The sources of the TV signals for APB are 10 signals, dialed from ATs, studio TV cameras, 16 millimeter telekineprojector, diaprojector, equipment for inserting captions and electronic reprojection, and three complexes, consisting of two APB, different from the others, in that each APB can receive simultaneously from ATs 12 external programs, and the complex includes a video tape room with 12 tape recorders and slow motion recording and playback equipment. The complexes for some companies also have tape recorders and an electronic switch, which switches the channels assigned to a given company.

About 300 video tape recorders, including more than 150 brought over by foreign companies, are installed in a centralized video recording unit (TsBVZ) and in the rooms of the TV companies, which will make it possible to record the complete volume of Olympiad-80 events, record national programs, play back recordings and clips for inclusion in programs, assemble and circulate video tapes and combine video recordings with audio commentary, all at the same time.

The central telekineunit TsTKB is intended for viewing films, for re-recording them on video tape, or for use as insertions in programs produced by APB.

The equipment of the central synchronization system, installed at ATs, synchronizes and phases video signals from all program sources, both Moscow and other cities that feed their signals to OTRTs. This system is controlled by a highly stable generator, installed in the TTTs building. The central synchronization signals are supplied to all sources on a separate communications channel.

The delivery of 20 produced programs is controlled by duty officers at the finished program dispatcher's rooms (ADGP); there are three of these rooms, and each can control nine programs. The channels are supposed to be distributed among rooms as follows: one room for seven programs will be used for "Eurovision" countries, one, also for seven programs, will be used for "Intervideniye" countries, and one for six programs -- for the United States, Canada, Japan, Australia, Latin America and Africa.

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Figure 4.

The entire TV system will be controlled from the main programming and technical coordinators' control room (AGPTK), which is equipped for monitoring all programs, dialed at ATs on a manual switchboard, and the corresponding coordination communications.

All TV channels from the Olympic sites that go to OKTs are transferred by cable to the Central control room (ATs) of OTRTs, at whose input are installed incoming line correctors. Three Soviet television programs and

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three cultural programs from TTTs are fed to the ATs input. An international audio (intershum) channel is supplied with each video channel delivered to the ATs of OTRTs.

The ATs of OTRTs, a structural diagram of which is shown in Figure 5, is a sophisticated system, which corrects incoming lines, reproduces information for delivery in several directions, manual switching to consumers that do not require real-time switching and, finally, operational switching by electronic switchboards with remote control of consumers. All programs from outside sources, i.e., from the sports facilities, are fed to input units with correctors and amplifier-reproducers. There are three such units -- one main international program unit with 50 inputs, in which reproduction for eight outputs is accomplished, and two 10-program units, where reproduction for four outputs is done. These units are set aside basically for programs produced by TV companies. One output from all sources is connected to central synchronization equipment, installed at ATs. All recipients that do not require immediate switching and whose programs can be dialed on schedule, are connected to manual switchboards.

Fifty outside program sources end at matrix "A" of the electronic switchboard, and the sources can be switched in real time to 64 outputs, to which are connected 15 APB with four outputs, BTK, etc.

To matrix "B" go 60 outside and 90 inside sources; they are switched in real time to 288 recipients: APB; the outputs to the international network through ADGP; commentary unit from a kinescope screen BKEK; ADIP; video recording rooms, etc.

In conclusion we should like to explain the organization of the retransmission of events on the long-distance tracks -- the 100-km cycling track on Minskoye shosse, the start and finish of which will occur at the 23-km mark, where a grandstand has been built; the marathon race, the 20- and 50-km walks, the start and finish of which will take place at the Grand sports arena of the central Stadium imeni V. I. Lenin. The progress of the athletes on the track will be shown by cameras, set up at a distance of up to 1,000 meters from PTS, and from there by means of cameras installed on a truck, helicopter and motorboat, which will be moving along with the column.

The signal from the mobile systems will be transmitted by portable radio relay equipment to PTS, which produces the program, and from there by radio relay to OKTs. The bicycle race will be shown for a distance of about 10 km from the start-finish point, and the marathon and walk races will be shown for approximately 70% of the route. Judge communications channels will be set up along the cycle track, which will provide information from the route to a distance of 25 km from the starting point and 50 km, where the racers turn around; thus, data on the athletes will come from 25, 50 and 75 km, and for the last 10 km before the finish the contest will be shown on television. On the marathon route the race will be shown at the

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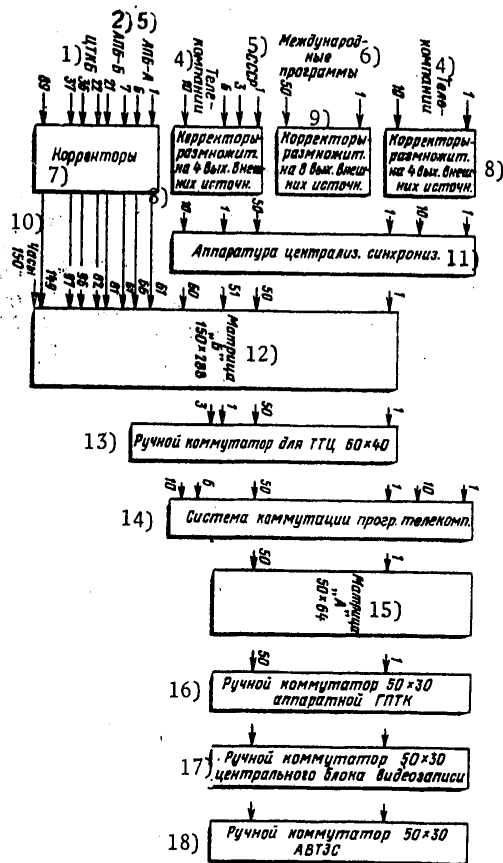


Figure 5.

- | | |
|--|--|
| KEY: 1. TsTKB | 12. Matrix "B" |
| 2. APB-B | 13. Manual switchboard for TTTs |
| 3. APB-A | 14. Program switching system of TV companies |
| 4. TV companies | 15. Matrix "A" |
| 5. USSR | 16. Manual switchboard 50 x 30 of GPTK control room |
| 6. International programs | 17. Manual switchboard 50 x 30 of central video recording unit |
| 7. Correctors | 18. Manual switchboard 50 x 30 of AVTZS |
| 8. Correctors-reproducers for 4 outside source outputs | |
| 9. Correctors-reproducers for 8 outside source outputs | |
| 10. Clocks | |
| 11. Central synchronization equipment | |

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start and finish and from PTS near Okruzhniy bridge, "Rossiya" hotel, "Udarnik" movie theater, and at certain other points from mobile cameras, installed on a motorboat and truck.

The route of the Olympic torch from Greece to Moscow is 4,980 km long; it will be relayed from one group of athletes to another at distances of approximately 100-120 km. Service vehicles, including a communications van, which with the aid of radio stations will maintain communications with nearby cities and through them on communications lines with the Olympiad-80 headquarters in Moscow and "Estafeta" headquarters in those cities, will travel along with the column of athletes. The progress of the column along the route and on the approach to Moscow -- the last leg, will be shown in many places, until the torch arrives at the Grand sports arena of the Central Stadium imeni V. I. Lenin during the ceremonial opening of Olympiad-80.

The Olympic television and radio broadcasting programs of the Soviet Union will be produced by special TTTs services and from there will go to Moscow and union network transmitters. At each sports facility there are seats for Soviet TV and radio broadcasting commentators, from which the channels pass through OKTs and OTRTs to TTTs; in addition, international programs, which can be used for producing Soviet programs, will be supplied to TTTs from ATs.

General organizational control of all services that participate in the transmission of TV and radio broadcast programs from the 22nd Olympic games in Moscow will be accomplished by the Gosteleradio Center, located at OTRTs, and by the Center of the USSR Ministry of Communications, which will be set up at OKTs.

The Olympiad-80 TV and radio broadcasting complex is grandiose not only in terms of volume, but also in terms of its technical and organizational complexity, and in the summer of 1979 it successfully transmitted the Spartakiad games of the Soviet nations.

In spite of the fact that the complex was developed on the basis of new equipment, the facilities had to be planned without a technical plan, in the working drawing stage. There was not time to develop documents on the equipment, but success was achieved by virtue of close contact between the designers and developers of the equipment and the customers.

Dozens of enterprises, planning and research institutions, factories, assembly and construction organizations of the USSR Ministry of Communications, Ministry of the Communications Industry, USSR Gosteleradio, Ministry of Precision Machine-Building Industry and Mosgorispolkom [Executive Committee of the Moscow City Soviet of Workers' Deputies], participated in the development of the complex.

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If the TV and radio broadcasting complex that will produce Olympic programs, and the communications facilities that will deliver these programs to the international network are an integral part of Olympiad-80, bringing to it billions of viewers and listeners, the technical radio communications systems developed for the Olympiad in addition to wire communications systems, are service systems by nature. They will help to solve certain operational organizational problems and to improve the level of service provided for the organizers of the games and guests.

Recalling that the Olympic events will be relayed by radio and TV from nearly 100 locations, it becomes clear how many organizers and representatives of many other organizations will have to move around the city and within the confines of the sports facilities. The need for speedy communications with people on the move was studied, and the decision was made to develop several kinds of radio communications for communicating with mobile facilities.

The "Altay-3M" UHF radio telephone communications system was developed for communicating with vehicles in Moscow and Tallin. It connects through a central station mobile subscribers with municipal telephone network subscribers and department dispatchers and with each other. Through a dispatcher one can hook up with internal telephone networks, which end at the dispatcher's console, and with subscribers of other cities by the pay system.

The "Altay-3M" system in Moscow has seven trunks: two for the immediate needs of the Olympiad-80 Organizing Committee; three trunks for municipal services associated with the preparation and support of the Olympiad (emergency, public health, medical, construction organizations, etc.); two trunks for switching subscribers of the existing "Altay-1" system to the "Altay-3M" system.

The system includes: a central radio station and control center; 40 departmental dispatcher offices, including six for the immediate needs of the Organizing Committee; 1,281 subscriber stations (Figure 6), including 400 for the immediate needs of the Olympiad; cable connecting lines between control center and central radio station and between the control center and dispatcher stations.

The central radio station (the equipment and antenna) is installed in the ORPS tower, the control center is set up in a separate room at one of the ATS in the center of Moscow, and the departmental dispatcher stations are in separate rooms of the corresponding services.

The "Altay" UHF radio telephone communications system in Tallinn has two trunks, one of which is intended specifically for mobile marine facilities of the ASU system. The central radio station is located in the Television tower of the city, and the control center is at ATS-22 near Piritä. Five departmental dispatcher stations are housed in rooms of the new Olympic

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Figure 6.

complex in Pirita for the following services: press center, judge staff of the yacht club, transportation service, Olympiad-80 Organizing Committee and backup.

A total of 150 subscriber stations will be installed on vehicles for covering the Olympic games in Tallin.

The radio search system in Moscow and Tallin is intended for the organization of operational control during the final stage of preparation for the games and during the events.

Radio search plays an important role in the smooth functioning of the administrative and management apparatus and other services in consideration of the fact that such a large community of officials of various departments will be directly involved in the solution of operational problems.

The municipal radio search system operates on one frequency in the UHF band with a 25-30 km service radius. The equipment is installed in the tower of the telecenter. The control center in Moscow is housed in the first-aid building, since this system will be turned over after the Olympiad for serving Moscow medical institutions. The control center in Tallin is housed along with the control center of the "Altay-3M" system.

Officials are equipped with compact pocket receivers with acoustic and digital indicators, 3,000 for Moscow and 400 for Tallinn.

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The "Poisk" system provides selective acoustic paging and circular calling of a certain group of subscribers. Also, the digital display of the pocket receiver shows up to 10 different pre-encoded messages. With the equipment an acoustic signal can be sounded for a short time, and it remembers information about two previous calls.

A call is placed from a telephone of the municipal telephone network through the dispatcher service of the control center, where additional unencoded messages can be stored. A call can also be placed from an external console, set up at a prearranged place.

After a call is received the subscriber performs a prearranged action, programmed in code, or calls by municipal telephone the dispatcher center, where he receives additional information.

The "Altay-3M" system provides telephone communications with subscribers riding in cars, and the "Poisk" system pages a subscriber and transmits to him just a few pre-encoded instructions, but does not provide an opportunity to converse with him. Therefore it became necessary to develop yet another form of radio communications -- for subscribers on the move, both in the city and in vast sports regions.

This system, which augments the wire dispatcher system but does not permit communications with people on the go, serves the Olympiad-80 Organizing Committee headquarters, providing communications with workers who solve operational-organizational problems associated with the games, and with workers responsible for maintaining public order, communications on contest routes, judge communications, etc.

Table 2

Sports complex	Number of radio networks	Number of radio statics
Stadium imeni V. I. Lenin in Luzhniki	23	214
"Olympic" stadium on pr. Mira Krylatskoye	13	111
TsSKA	17	176
"Dinamo" stadium	9	76
General purpose field house on ul. Lavochkina (Khimki)	9	91
"Urozhay" in Bitets park	3	22
"Sokol'niki" gymnasium	5	89
"Izmaylovo" gymnasium	3	28
Young pioneers' stadium	3	24
Archery range in Mytishchi	4	29
	5	34

This kind of radio communications is set up in the UHF band with the aid of handheld transceivers. A total of 100 networks was developed, of which 6 are citywide networks and the others function within the sports regions.

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The city networks were set up with the aid of receiving-transmitting retransmitters, installed in Ostankin tower at about 250 m; these networks include 375 radio stations. The number of networks and radio stations is indicated in Table 2, and the networks of the sports regions include a total of 900 portable sets. Twelve frequencies are allocated for the city networks and 20 for the sports regions, some of which are repeated, which is possible in view of the short effective range of a station in a region.

The grandiose complex of information transmission systems, developed for Olympiad-80, substantially expands the capabilities of Soviet television, radio broadcasting and electrical communications. In particular, the urgent problem of transmitting both primary and secondary Central television programs to Siberia, the Far East, Kazakhstan, Central Asia at times convenient for the inhabitants will be solved, international retransmission conditions will be improved and the quality of the TV signal will be better.

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USSR

LONG-DISTANCE TELEPHONE COMMUNICATIONS -- TOWARD OLYMPIAD-80

Moscow ELEKTROSVYAZ' in Russian No 6, 1980 pp 18-23

[Article by A. N. Tyulyayev]

[Text] Description of Existing Electrical Communications Systems. Olympiad-80 is deservedly considered a grandiose sociocultural event of our day. Hundreds of thousands of athletes, guests from other continents and Soviet tourists will come to our capital in July. Thousands of special correspondents will inform their press agencies, radio and TV companies about the athletic events that will be taking place.

Great construction and installation operations have been completed on new and absolutely unique communications complexes, both in Moscow and in other cities of our country. A great number of specialists will be enlisted in the effort to provide Olympiad-80 with communications, both in the cities where games will be held, and along all highways. In addition to new Olympic electrical communications systems of the country, previously constructed facilities will also be used.

Our nation has an extensive network of cable, radio relay and satellite communications lines. Their total length is hundreds of thousands of kilometers. Long-distance communications lines go to all rayon centers of all the republics, krays and oblasts of the Union. The communications channels that are organized on the described lines are doubling in length every 5 years. The number of calls placed on these channels is increasing at a rate of 10-11% annually and exceeded 1.2 billion in 1979. A total of 500 million telegrams were delivered on the public network, and tens of thousands of industrial associations, enterprises and institutions were added to the subscriber telegraph network. Central newspapers are transmitted on communications channels to 41 major cities of the country, which permits them to be delivered to out-of-town readers the same day they roll off the Moscow presses.

Communication channels enable the entire population of the country to hear broadcast programs. Central TV programs are received dependably over most of the territory of the Soviet Union. This is accomplished by virtually

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instantaneous transmission to our national population of information on the most important and urgent events.

Naturally, the explosive expansion of the volume of information being transmitted would not have been possible without automation of the connection-making process. Our country has 50 automated long-distance telephone exchanges (AMTS) with coordinate connectors -- exchanges of the AMTS-2, AMTS-3 and ARM-20 types, in addition to more than 100 AMTS-1M exchanges and hundreds of racks of equipment for automating oblast communications (SKVA, AVTS [not further identified], semiautomated types, etc.). A big step was taken in a short time in the automation of long-distance telephone communications. Today about 40% of all the channels that exist in our country are used for automatic communications. More than 80% of connections are made automatically in many cities and major industrial centers. This has been promoted to a considerable degree by the adoption of long-distance coin-operated telephones (MTA), which number more than 18,000.

The daily telephone traffic emanating from Moscow amounts to 250,000 calls. Moscow has around-the-clock automatic telephone communications with 120 major cities of the Union, including all Union republic capitals. Most subscribers of the Moscow municipal telephone network can place long-distance calls without dialing their own numbers, which greatly simplifies the connection-making process and shortens the time the exchange mechanisms are occupied. During the current year nearly all Moscow ATS [Automated telephone exchange] will be equipped with automatic number recognition (AON) systems, which will eliminate the dialing of the caller's number for virtually all GTS [Municipal telephone exchange] subscribers. About 800 MTA are busily at work in Moscow.

Volume of Electrical Communications Services at Olympiad-80. The 22nd Olympic games, as is known, will include all kinds of events in 27 athletic facilities in Moscow, in addition to Leningrad, Kiev, Minsk and Tallinn. The transmission from Moscow to all continents simultaneously of up to 20 color TV and up to 100 broadcast programs will be accomplished with the aid of both ground and space communications systems.

From every location where events are held the correspondents can immediately call any country, both by telephone and by Telex. Furthermore they will be able throughout the Olympiad to make personal utilization of direct communications channels. Athletes and tourists will be offered automatic telephone communications at stadiums, hotels and city phone booths, and press representatives also will have the services of the Main press center and press subcenters. Hundreds of long-distance and international pay phones will also be installed in communications offices and hotels for the accommodation of Olympiad guests.

Many cable and radio relay lines, in addition to space communications stations, through which additional communications channels will be generated, are being constructed and reconstructed to assure quality

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service to customers on many routes of the Soviet Union. Other main construction projects are the MTS-9 automatic long-distance telephone exchange and the new MN-ATS automatic international exchange in Moscow, and an automatic long-distance telephone exchange in Tallinn. These main projects are described briefly below.

Automatic Long-Distance Telephone Exchange (MTS-9) in Moscow. After the completion of construction MTS-9 will be the largest long-distance exchange, not only in our country, but in all of Europe as well. The building (see the cover) measures 220,000 cubic meters in volume. Fourteen floors of the first and second units of the building will accommodate technical equipment. Seventeen floors of the third unit will be occupied by administrative services. An auxiliary building will also be constructed for a cafeteria, a 600-seat auditorium, library and gymnasium. The technological rooms will accommodate equipment of three ARM-20 AMTS (exchanges T1, T2 and T3) with a total capacity of about 7,000 channels, an international automatic telephone exchange (MN-ATS) for 1,800 channels and a computer center (VTs).

The field of the long-distance exchanges is designed for 11,950 incoming and 7,034 outgoing points. The T1 and T2 exchanges will have about 2,000 and 1,500 outgoing channels, and the T3 exchange will have about 3,300 incoming channels. All three exchanges are connected as a single complex. It will also be possible to divert to the exchanges of the MTS-9 facility part of the load from the existing AMTS-2 exchange of the MTS-5 facility. This will make it possible to convert the latter to an exchange with high channel utilization.



Figure 1.

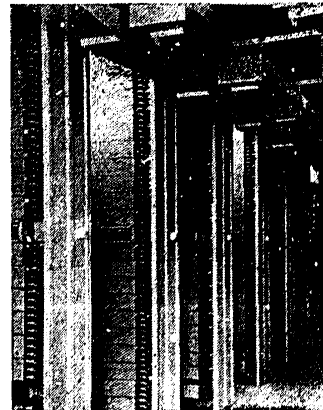


Figure 2.

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All the ATS of the city are divided into two zones: the ATS of the first zone has outlets to the AMTS of MTS-5, and the ATS of the second zone have outlets to exchanges of MTS-9. When fully operational 60% of all automatic hookups will be made through MTS-9, and MTS-5 will have the remaining 40%. It is noteworthy that there are no plans to build a switchboard room at MTS-9, and therefore access to telephone operators of pay services of other facilities (MTS-2--MTS-5) of TsMTS [Central long-distance telephone exchange] will be gained through the T1 and T2 exchanges. Connections will be made at the T1, T2 and T3 exchanges by multicoordinate connectors MKS. A general view of MKS racks is shown in Figure 1, and a view of racks with line sets is seen in Figure 2.

Most noteworthy of the technical features of the ARM-20 exchanges of MTS-9 is the utilization of new equipment for metering the cost of long-distance telephone calls (MTR). Information about bills for MTR placed from hotels will be recorded on small key punches, and accounts on other MTR will be kept on magnetic tape. This necessitated the development for MTS-9 exchanges of special equipment for identifying in the overall traffic the MTR made from hotels by means of analysis of subscriber category (based on data obtained from AON) or of the calling subscriber's number.

The use of magnetic tape recording equipment made it possible to substantially reduce (approximately 10-fold) the area occupied by call cost accounting systems and to substantially increase the reliability of information on subscriber accounts.

Activation of the exchanges of MTS-9 will make it possible to communicate automatically with virtually all oblast centers of the Union and with 25 rayon centers of Moscow Oblast, and without sacrificing all existing long-distance communications facilities, especially AMTS-2 of the MTS-5 facility and RVM (long-distance call distributors). The total traffic processed by TsMTS will more than double.

After 1980 a T4 exchange, utilizing the latest electronic equipment, will be installed in available spaces of the 7th and 8th floors of the technological units. The startup of the first unit of this exchange will provide an opportunity to increase the capacity of MTS-9 by 4,600 channels, and there will be more than 10,000 channels when it is fully operational (in the same space).

IKM-30 [Pulse-code modulation] transmission systems will be used extensively for organizing incoming and outgoing communications with ATS of the Moscow municipal telephone network. The channels of IKM-30 systems will provide nearly 7,000 connecting toll lines (ZSL) and about 3,700 connecting lines (SL). Description of the organization of communications between MTS and ATS of such a large municipal network as the Moscow network is the subject of an independent article. Suffice it to say here that the cost of establishing communications between MTS and municipal ATS is commensurable with the cost of the MTS-9 facility itself.

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Several cable trunks, equipped with high-capacity K-3600 and K-1920 systems, have been placed in operation in long-distance LATs [Line-equipment shop] of the MTS-9 facility. Startup and adjustment work is complete at MTS-9. The long-distance channels are connected to the network.

International Telephone Exchange. The existing Moscow international exchange has a capacity of about 400 channels, is equipped with MN-60 semi-automatic machinery and can operate only by the International Telegraph and Telephone Consultative Committee [ITTCC] No. 4 signal system.

Of the 57 countries with which the USSR has direct telephone communications, communications with 9 of them is conducted by radio, with 14 by space communications lines, and with 34 by cable and radio relay links. By using international transit exchanges of the USSR it is possible to communicate with virtually any country in both hemispheres. Automated telephony has existed between Moscow and Berlin, Prague, Warsaw, Budapest for 10 years, and since 1974 with Sofia.

The total capacity of the new international exchange in Moscow, the MN-ATS, is 1,600 channels. The exchange will include quasioelectronic equipment for automatic communications, patchless switchboard equipment (Figure 3), an information center and maintenance equipment.

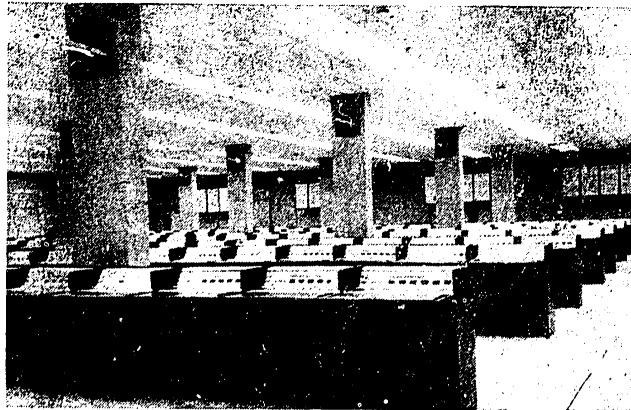


Figure 3.

The LATs has equipment for generating international channels, a switchboard room of the patch cord type (of the interrayon toll center)

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type -- MRU) with 360 manually serviced channels. The exchange will include international channels operating by the ITCC No. 4, 5, 6, R-2 multifrequency signal systems, in addition to long-distance channels, equipped with one- and two-frequency signal systems.

The mentioned number of channels and lines will provide automatic communications on 19 routes, including with all socialist countries of Europe and many capitalist countries.

Private converter racks with a multiplexed signal channel (SIP VSK) have been installed in LATs for utilization of the ITCC R-2 system, used for the first time in the USSR, and 84.08 and 411.92 kHz test frequency oscillators and receivers are used on the channel routing line.

Moscow subscribers gain access to an international exchange both through the T1 or T2 exchange (of the ARM-20 type) of MTS-9, and through RVM of the patchless MTS.

To gain access to MN-ATS the subscriber must dial "8-10" for automatic hookup and "8-19X" for access to manual toll service (X is the code of the language in which the subscriber will converse).

A call reception service, organized at MN-ATS, and for which the information center will be used, is extremely interesting. All data on incoming calls is immediately fed into a special computer, where they are sorted by priority, category and time of arrival. Using the data on the calls, the computer controls the display of the call service, with the result that the traffic on the busiest lines is regulated. The sorted calls are printed on teletypes or by an automatic digital printer (ATsPU), located in the switchboard rooms. The information center is also used for keeping records on completed calls, for making inquiries, etc.

Information on accounts with subscribers for international telephone calls (MNTR) is transmitted to the accounting center via the data transmission (PD) channel at 2,400 bits/s. In the event of damaged channels or when the accounting center is closed all information is recorded on magnetic tape, and information on urgent accounts for calls from hospitals is recorded by teletype.

The new MN-ATS is a powerful switching system, in which connection-making processes are controlled by special computers (there are two of them at MN-ATS), and the field is built on gercon matrix connectors. A view of the switching equipment is seen in Figure 4, and a view of the computer complex with data input-output systems is seen in Figure 5. The maximum capacity of the MN-ATS exchange is $8,000 \times 8,000$ field points.

The technical capabilities of the exchange permit organization of automatic incoming and outgoing international communications for subscribers not only in Moscow, but in other cities, in which coordinate ATS are installed. For

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this purpose it is necessary to refit the existing ARM-20 exchanges with line sets, to convert the memory of the cost accounting systems to a larger number of characters and to install at AMTS-2 and AMTS-3 new automatic outgoing IMRA registers, which understand a larger number of characters than the existing IMRA.

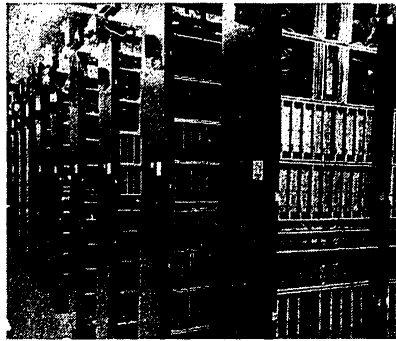


Figure 4.

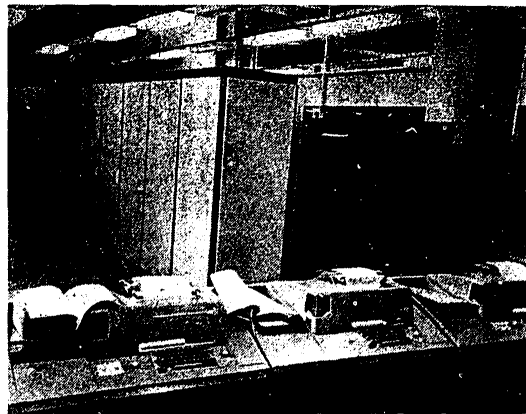


Figure 5.

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Incoming automatic international communications with other cities of the Union will be organized this year.

AMTS in Tallinn. The construction of the AMTS in Tallinn (Figure 6) with a capacity of 1,500 channels was finished in 1978, a year ahead of schedule, and the exchange was assembled in 1979. The AMTS uses ARM-20 equipment. The opening of AMTS in Tallinn marked the complete automation of long-distance telephone communications in Estonia and the establishment of automatic communications with Moscow, Leningrad and the major industrial centers of the country.

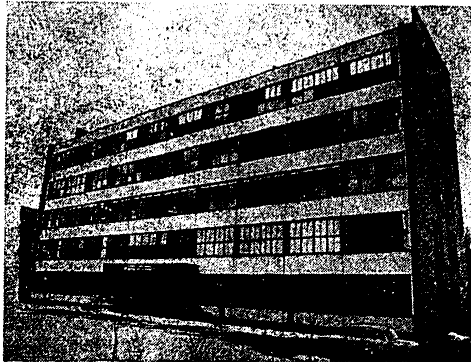


Figure 6.

The Tallinn AMTS is connected to the Moscow MN-ATS by direct outgoing and incoming channels, which offers Tallin subscribers automatic international communications. Direct international communications between Tallin and the Scandinavian countries has also been organized.

Phone booths, which will offer all electrical communications services, have been set up at the press centers, at the games and in the hotels of the city.

The "Telex" automatic exchange has also been expanded in connection with the holding of the Olympiad in Tallinn.

International Pay Phones. Press subcenters, and the Main press center of Olympiad-80 on Zubovskiy bul'var' in Moscow, will be organized, as has already been mentioned, in all locations where the games will be held.

All press centers will have phone booths for international automatic and manually switched telephone communications. In Moscow the phone booths

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using direct lines and serial numbers have a hookup with the switchboards of the old and new international telephone exchanges.

For organized automatic communications in phone booths, major hotels, Olympic village and other locations about 200 international pay phones have been installed. Some of them have a built-in minicomputer. When coins are inserted it determines the cost and call time (in consideration of the rate) and gives the customer signals, reminding him that his toll time is expiring, or it returns unused change. This eliminates the need to install additional equipment at ATS. For the other pay phones without microcomputers the analogous functions are performed by equipment installed at the nearest ATS.

A general view of the long-distance pay phones is shown in Figure 7.

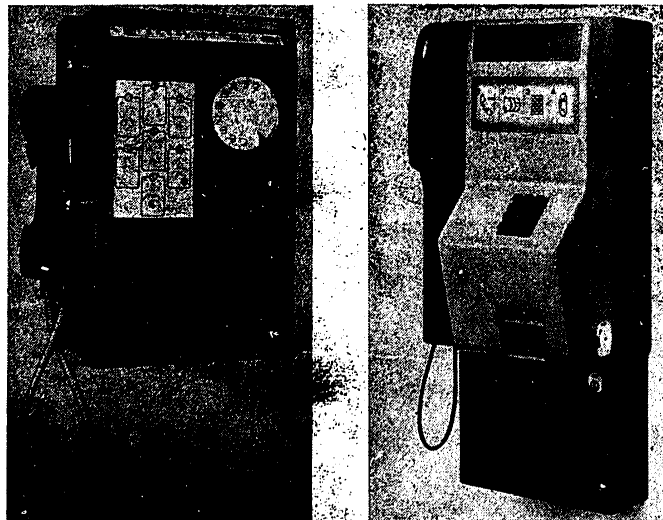


Figure 7.

Reconstruction of Cable and Radio Relay Links. New cable and radio relay communications lines have been built and existing ones reconstructed with modern K-3600, VLT-1920, "Voskhod-M," RRL-GTT-70, KURS and other data transmission systems, in preparation for the 22nd Summer Olympic games. The terminal equipment of these systems is housed in several special line equipment shops. A general view of the equipment of one of the LATs of the MTS-9 exchange is shown in Figure 8.

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Figure 8.

The adoption of the aforementioned transmission systems, built on modern semifinished products, along with a sharp increase of the number of channels, significantly improves quality and reliability. The line channels of the K-3600 system are designed for 1 pW0/km interference, which makes it possible to establish intercontinental communications for a distance of up to 25,000 km. New standardized converter and generator equipment, built on integrated circuits, is used in the terminal exchanges. This equipment is economical in terms of energy consumption and has high performance reliability.

Primary (PTsSP), secondary (VTsSP) and tertiary (TTsSP) digital transmission systems are also being adopted in the network at the same time as systems with frequency division multiplexed channels.

Progressive power systems with electronic voltage converters are used in all the newly built exchanges.

By virtue of the work done on cable and radio relay links it will be possible to generate the necessary number of channels for telephone communications within the country, for new international connections and for organizing audio broadcast and TV accompaniment channels, called triads.

Special equipment is used for generating high-class broadcast channels. The channeling broadcast equipment is intended for generating in the standard primary 60-108 kHz group one stereo channel, or two high-class monaural channels (30-15,000 Hz), or one high-class monaural channel and six audio frequency channels (any private converter equipment can be used for generating audio frequency channels). This equipment meets standards

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on monaural and stereo broadcast channels in accordance with ITTCC recommendations. It is designed in two different versions -- rack and portable (suitcase) models, and the functional components of the portable version can be mounted in a rack.

Automatic test instruments, with which all the parameters of a monaural broadcast channel can be measured for 6 minutes, can be ordered with the set. The test results are recorded by an automatic recording instrument that comes with the test set.

Basically Soviet-made equipment, and some foreign equipment (Yugoslavia, Hungary, West Germany, Finland, Japan) was used in the reconstruction of the long-distance communications facilities and for the construction of the new Olympic facilities.

The organization of long-distance and international communications and broadcast channels and channel switching involves problems in the preparation of transmission, telegraph and document switching systems, local telephone systems, training of specialists for serving them, etc., but these are subjects of independent articles. The material presented above gives a good idea of the scope of the work done to ensure reliable communications during the 1980 Olympic games. There is no doubt that the communications specialists of the Soviet Union will skillfully service the communications systems and give television viewers and radio listeners around the world an opportunity to gain satisfaction from the athletic contests in Moscow.

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