

TRS 2000



AZIMUT

Automated Transmitting and Receiving Centre

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Function

The Automated Transmitting and Receiving Centre (ATRC) TRS 2000 is designed to provide fixed channels for data reception and transmission between dispatchers and aircraft crews to the benefit of the Unified System of Air Traffic Management of the Russian Federation (USATM RF).

The ATRC is manufactured differently for installation in stationary locations, in containers and in cases:

- as spaced apart receiving and transmitting radio centres;
- as a combined receiving and transmitting radio centre.

Combined receiving and transmitting radio centres belong to a conceptually new trend of radio communication systems development for air traffic management. They allow to locate all the equipment in one and the same room, to install aerials within a limited space and to provide the necessary electromagnetic compatibility conditions. Herewith it is no longer necessary to install extensive communication lines, the expenses for lease of land and for maintenance of buildings and facilities are reduced and less auxiliary equipment is needed.

Key Features

- Provides simultaneous independent operation of from 2 to 46 frequency channels of voice communication.
- Is equipped with a remote control and operation system.
- Connection interruptions through any of the air communication channel (in case of faults on the radio facilities or the technical equipment of the ATRC or the power supply does not exceed 3 seconds).
- Provides control over uninterrupted operation period of each of the transmitting units in the radiation mode and prevents from their continuous operation in this mode in case of failure of the radio facility control channel.
- Provides operation of several receivers or transmitters to one aerial.
- Neither the ATRC in whole nor its equipment needs on-line maintenance.

Equipment Location

The equipment is located in unitized hardware racks (SHAPP) of a 19-inch standard with dimensions 2000×600×800 mm.

- SHAPP-08 for transmitters and radio terminals.
- SHAPP-MK for combined devices.
- SHAPP-PM for receivers.

The internal cable run of the hardware racks provides connection of radio facilities:

- to the AC power supply network of 220 V and 50 Hz;
- to the DC power supply network of 24 V;
- to external systems (dispatcher voice communication system, remote control and operation system, communication lines etc.).

Providing for Radiation Mode

The following ways to transfer any of the ATRC channels to the radiation mode on the part of the external system exist:

- by means of 0 V level (contact to frame) through a separate line;
- by providing continuous voltage from +12 V to +27 V through the midpoint of the input transformer of the radio terminal modulation circuit;
- by means of +12 V to +27 V level through a separate line;
- by means of an AC signal with a frequency of 1020/2040 Hz.

Operation and Control

Remote control and operation of the ATRC is carried out by a special system which consists of a central unit and peripheral units installed in the air traffic management centre and at the ATRC locations accordingly.

The central unit can collect, analyze and display the information on the technical state of up to 20 ATRC, as well as to manage the configuration of technical devices being a part of them. A peripheral unit provides interaction with 92 radio facilities and devices being included as a compound of the ATRC.

In order to implement various system solutions, the ATRC radio facilities have a number of extra capabilities.

Operation on Offset Frequencies (Offset Mode)

In order to provide a solid communication field in the conditions of a sharply rough terrain (like in mountainous areas), transponders can be installed. If the frequencies of the transponders are slightly set off related to the frequencies of the main radio facilities, then at the moment the dispatcher presses the push-to-talk switch, distant transmitters with an offset carrier frequency will go over to radiation mode on one communication channel and all the incoming signals will be received on board of the aircraft without distortion. The following rated values of the carrier frequency offset exist: ± 2.5 kHz, ± 5 kHz, ± 7.5 kHz.

Operation on Channels with Continuous Radiation

The air traffic management systems have a number of channels needing twenty-four-hour transmission of messages (e.g. "Meteo"). The transmitter herewith operates in the radiation mode on a twenty-four-hour basis.

Power Supply by Storage Batteries

Documents require equipping of air traffic management systems with emergency radio facilities receiving power from chemical power supply sources. Simultaneous connection of DC and AC mains to the radio facilities is most cost-effective. In case of failure in the AC mains the radio facility is automatically switched over to power supply from chemical sources without interruption in connection and without reduction of the transmitters capacity.

Suppression of Intermodulation and Spurious Radiation

When complex ATRCs with a significant number of frequencies is implemented, intermodulation radiation of different kinds may appear. In order to improve electromagnetic compatibility and to reduce the level of intermodulation and spurious radiation, fitting the modern radio facilities with circulators providing suppression of intermodulation radiation of the third level up to minus 65 dB and of bandpass filters suppressing off-frequency emission to the level of minus 44 dB is possible.

Providing for Duplex Mode and Re-Broadcasting Mode for the Transponder

The simplex, the half-duplex and the duplex operation modes can be organized by means of a single receiving and transmitting unit if separate synthesizers are applied in the receiver and in the transmitter. Herewith the receiver and the transmitter are connected each to a separate aerial which allows to implement the mode of duplex and re-broadcasting.

An Example of a System Solution

The automated transmitting and receiving centre "ATRC-Domodovo" is designed to provide fixed channels of receiving and transmission of voice data in VHF range between dispatchers and aircraft crews to the benefit of the lane sector.

The delivered ATRC complete set includes VHF range radio facilities, namely single-channel transmitters and receivers, multi-channel receiver, transmitter and receiving and transmitting unit. The ATRC radio facilities provide eight wireless communication channels and operate without back-up.

In order to provide remote control and management all the receivers, transmitters and the receiving and transmitting unit are connected to the peripheral unit (PU) of the remote control and management system (RCMS) through a digital bus. The PU is connected through an RS-232 jointing to the central unit (CU) which allows to exercise control and management over the ATRC radio facilities.

Main Technical Specifications of TRS 2000

Frequency range:	
· VHF	118 MHz to 137 MHz
· UHF	220 MHz to 400 MHz
Number of wireless communication channels, up to	46
Back-up possibilities for radio facilities	100% with automatic selection 100% with manual selection Sliding
Output HF-capacity of transmitting radio facilities	5 W to 50 W (can be regulated)
Sensitivity of receiving radio facilities, at most	1 mkW
Modulation type	A3E (AM), MSK, D8PSK, GFSK
Data exchange modes	ACARS, VDL-2, VDL-4

Power Supply (with automatic switching over)

AC mains	220 V (+10%; -15%), 50 Hz
DC mains (with a grounded "minus")	+24 V

Operating Conditions

ATRC equipment outside of stationary locations or containers:

· environment temperature	-50 °C to +55 °C
· precipitation effect (rain intensity), at most	3 mm/min
· wind force effect (wind speed), at most	55 m/s
· ice accretion (thickness), at most	5 cm

ATRC equipment inside of stationary locations or containers

-40 °C to +50 °C

Reliability

MTBF, at least	50 000 hours
Life cycle	15 years