

# COMMUNICATION SYSTEMS



# MOBILE RADIO RELAY STATION ON A QUICK DEPLOYED PLATFORM



## PURPOSE

Setup of radio-relay and cable (copper-cable and fiber-optic) communication lines at the operational and tactical level control, zones of wireless broadband access and radio communications networks of the DMR standard as a part of field support communication centers, Armed Forces communication centers as well as to ensure their binding including its binding to the public telecommunication network.

## BASIC CHARACTERISTICS

### Setup:

2 radio relay communications lines applying digital radio relay stations of S-band frequency.

2 radio relay communications lines applying digital radio relay stations of UHF band.

2 radio relay communications lines applying digital radio relay stations of S-band frequency (up to 4 E1 and Eth up to 50 Mbps).

a single radio relay communications line applying a digital radio relay station of S-band frequency (up to 16 E1 and Eth up to 310 Mbps).

areas of wireless broadband access (Eth up to 250 Mbps);

2 digital communication systems applying of MGS-3M via P-296 cable (1E1).

2 digital communication systems (up to 4 E1 and Eth up to 15,2 Mbps).

4 digital communication systems via the optical single-modem cable of STM-1 level applying the synchronous access multiplexer.

2 digital communication systems via the optical single-modem cable with the Eth rate of 1 Gbps.

2 digital communication systems applying SHDSL linear interface unit from the multiplexer of the ultimate digital type (1 E1).

VHF radio communications in the digital mode applying the uniform radio set and old type radio stations.

DMR standard radio communications network applying "Klyon" radio relay station.

**Converting** of 2 E1 signals into four signals of Ethernet 10/100Base-T.

**Commutation** of 10/100 Base-T interfaces with a help of a switch of the 3rd level.

## TASKS TO BE SOLVED

Setup of the radio relay and cable (wire and fiber-optical) digital links between backup communications centers and communications center control points.

Setup of the radio relay digital links between backup communications centers and communications center control points of the regional Armed Forces grouping.

Automation of analog and digital links and communication lines distribution procedures.

Setup of the packet traffic transmission with the possibility of routing in the Armed Forces field basic network.

Ensure the information (voice and data) sharing in compliance with the operation overlay.

Technical interfacing with the hardware (stations) of field communication centers, stationary communications centers of the Armed Forces command posts.

# MOBILE RADIO RELAY STATION



## PURPOSE

It is intended for usage at a strategic level of control as a part of backup communication points for arrangement of the radio-relay and cable (wire, fiber-optic) digital communication links of the Armed Forces field support communications network as well as the link lines of the communications centers of the Armed Forces control points and public telecommunication networks. It provides the information and technical interfacing with the telecommunication hardware of the various equipment communication units.



## BASIC CHARACTERISTICS

Manual and automatic link switch (with a possibility of digital streams multiplexing/ demultiplexing) and transmit digital streams via radio links (of radio relay and broadband access and cable (wire & fiber-optical) communications with a further possibility of their output to cable inlets.

Receive/transmit via radio relay links of S-band in two streamlines up to 16 E1 streams or Ethernet stream.



Receive/transmit via radio relay communications in UHF-band in two streamlines - one E1 stream or Ethernet stream.

Setup of wireless broadband access (IEEE 802.16e)

### Link-up:

E1 streams via four wire copper cable (up to 1 km)	up to 36
4 wire xDSL links built up by Megatrans-3M hardware (20 km except retransmission and up to 40 km with one retransmission)	up to 2
4 wire SDSL links (up to 5 km) built up by MPCs multiplexer	up to 4
optical links (with wave length - 1,55 μm) STM-1	up to 8
4 cable links of vocal frequency	up to 20
2 wire analog subscriber links	up to 8
2 wire analog subscriber links with a local battery	up to 6
Ethernet 10/100Base-T streams	up to 3
4 wire C1- I links	up to 4

The possibility to export 2 E1 streams and Ethernet 10/100Base-T stream via 4 wire copper cable communications (up to 10 km)

Setup of the VHF support communications when on the run and in the parking lot.

Link characteristics measuring.

Calculations of radio relay line intervals in the range from 0,2 up to 8 GHz.

## TASKS TO BE SOLVED

Setup of radio relay and cable (wire and fiber-optic) digital links between main communication centers and control communication points.

Automation of distribution processes of analog and digital links and communication lines.

Setup the packet traffic transmission with a possibility of its routing in the Armed Forces field main communication network.

Ensure information (voice and data) sharing between the command posts in compliance with the operation overlay

# MOBILE TROPOSPHERE COMMUNICATION STATION



## PURPOSE

Deployment of mainstream digital tropospheric communications and ensuring of digital communication links in the Armed Forces field control communication network performance, setup of direct communication between the communication points of mobile control centers in operational, operation-strategic and strategic command and control units.

## BASIC CHARACTERISTICS

Receive/transmit of E1, up to four interfaces	2048 kbps
Receive/transmit of E2 interface	8448 kbps
Receive/transmit of IP traffic via Base-T 10/100 interface	up to 8448 kbps
Automated control of antenna deployment and shutdown. Minimum pitch of resetting	1 Mhz
Minimal interval between receive/transmission	over 240 Mhz
Error ratio - $1 \cdot 10^{-6}$ :	
when the impulse level is 93 dBm	at the speed of 2048 kbps
when the impulse level is 87 dBm	at the speed of $4 \cdot 2048$ kbps

## TASKS TO BE SOLVED

Simultaneous communications in single or dual streamlines.

Receive/transmit of communications in one direction of digital group data stream velocities is 256/512/1024/2048/4x2048 kbps and 8448 kbps.

Data transmit via troposphere communication links at the range is up to 150 km.

Hardware management from an operator remote workplace.

Transmit of E1 streams, Ethernet and subscriber access signals in the structure of STM-1 synchronous transport modules via a single mode optical cable up to four modes.

Setup of up to 2 digital transmission systems (DTS) via an optical cable by using Ethernet L3 switch.

Setup of up to 2 digital transmission systems with a help of P-296 field cable.

Setup of up to 2 digital transmission systems with a help of two modems (up to 4E1 and Ethernet up to 15,2 Mbps).

Setup of up to 2 digital transmission systems with a help of SDSL interface linear unit from the structure of the digital access synchronous multiplexer.

Multiplexing/demultiplexing in (out of) E1 user interface digital streams.

Setup of the short wave service communication with interacting stations and communication control hubs.

Setup of VHF radio communications by using portable radio sets.

# MOBILE COMBINED RADIO STATIONS



## PURPOSE

Setup of open and secure voice communications, data transmission via HF and VHF radio links, via the network of a mobile operator, satellite communications station on the run and in a parking lot, at the operational and operational-strategic levels of management.



**“BOGATYR-2”**

## BASIC CHARACTERISTICS

SW communications with a grid pitch of 0,1 kHz  
in a duplex mode at the range of at least 300 km

VHF communications with a grid pitch of 12,5 and 25 kHz in  
the simplex mode  
communications range in a parking lot at least 50 km  
communications range on the run at least 24 km

Operation in the National Satellite Communications System  
at a speed at least 2048 kbps



**“DRAKON”**

Setup of access wire links to remote control points,  
remote work places and phone sets into a product local  
area network as well as technical integration via wire links up to 10 km

Setup of Ethernet link and transmission of IP traffic via operator  
communications in the coverage area of 3G/4G basic stations.

Setup of communications in DMR radio network.

## TASKS TO BE SOLVED

- Full-duplex operation in radio networks and radio routes with radio aids of old generation in HF and VSH bands.
- Operation via the satellite communication links in the National satellite communications and broadcasting.
- Operation of open and secure voice communications in the National networks of data transmission (traffic sharing).
- Connect to the network of the automatic dial-phone service either via wire links at the distance up to 5 km or by using the wireless communications.
- Transmit open, top secret information via satellite links and links of cellular operators by using the home-made encryption hardware.
- Operation of an official from the workplace when a product is on the run or at remote workplace in a parking lot.

# MOBILE COMMUNICATION STATION FOR TACTICAL CONTROL LEVEL



## PURPOSE

Setup of communications during various warfare types, implementation of peacetime tasks and emergency response at the tactical level of management. It can be used by officials at the operational and operational-tactical levels of management at the foremost control posts to provide communications for subordinate units and sub-units management.

It is used for performance on the run and in a parking lot either independently or when deployed as communication control centers.



## BASIC CHARACTERISTICS

It ensures HF communications with a spectrum frequency pitch of 0,1 kHz in the range duplex mode at least 300 km

It ensures VHF communications with a spectrum frequency pitch of 12,5 and 25 kHz in the simplex mode  
transmission range in a parking lot at least 50 km  
transmission range on the run at least 24 km

Operation in the National satellite communications system with rate of at least 2048 kbps

Setup of wired access lines for remote control points, remote workstations and telephone sets into the local network of the product, as well as for technical interlinking via wire lines up to 10 km

Setup of Ethernet link and transmission of IP traffic via communications operator network in 3G/4G basic station coverage zone.  
Setup of communications in the radio network of DMR standard.

## TASKS TO BE SOLVED

Transmit uncovered and classified packet traffic by using radio, wire and satellite communications facilities.

Transmit uncovered and secure voice messages in radio networks and radio routes.

Ensure operation of intercom between all product workplaces in the mode of circular and selective communications.

Ensure the work of an official from the product workplace with the possibility of its remote operation.

## MOBILE SATELLITE COMMUNICATION CENTER



### PURPOSE

Ensure the automated satellite communications via the space communications and broadcasting devices for civilian purposes located in the geostationary orbit including high-potential spacecraft of a broadband satellite communication network in Ku-band and C-band frequencies by providing of a digital high-speed link as well as military spacecrafts with the setup of antijamming satellite communications for various control links in C-band.

### BASIC CHARACTERISTICS

Setup of the automated satellite communications:

- via relay stations of Ku-band in the mode of back-to-back relay;
- via relay stations of C-band in the mode of back-to-back relay.

Data transfer rate:

- in the mode of back-to-back relay of Ku-band transfer	at least 2,048 Mbps
receive	up to 225 Mbps
- in the mode of back-to-back relay of C-band 1 stream with the data rate transfer	up to 2,048 Mbps
- in C-band mode with antijamming of 8 streams with the transfer data rate	1,2; 2,4; 4,8; 9,6 kbps



### TASKS TO BE SOLVED

Operation in the modes of the signal back-to-back relay in Ku-band and C-band: SCPC; MCPC/SCPC; TDM (DVB-S2)/TDMA (MF-TDMA).

Processing of S1-FL-BI, RS-232, RS232C, RS422, HDB3, OCK CH, OCK PN, V35, Ethernet 10/100 BASE TX, E1 external interfaces.

Possible operation via a suite of TCP/IP protocols as well as backup of RTP protocol.

Setup of 4 (3 optic interfaces with the wave length of 1,55 and one interface with the wave length of 1,31) fiber-optic communication links of STM-1 level by using SMD multiplexer synchronous access (hereinafter referred to as SMD) via a single-mode optic-fiber cable.

Formation of 4 Ethernet links by using SMD and their transfer in STM-1 structure with the rate of 91.392 Mbps; formation of 8 LAN streams for Ethernet traffic transmission in 4 WAN streams; formation of 4 FXS terminals; formation of four 4-wire links of the sound frequency; formation of 37 E1streams.

Setup of 2 Digital Communication Systems with a help of Orion-3 modem ensuring the simultaneous transmission of TDM traffic (up to four E1 streams) and Ethernet10 / 100 Base-T data with a total rate of 0.2 to 15.2 Mbps or setup of a high-rate communication link for Ethernet 10/100 Base-T data transmission at the rate of 0.2 to 15.2 Mbps per one pair of P-296 cable with the length of up to 9 km.

Deployment of the perimeter security alarm in 5 security sectors.

Connection of external telecommunication equipment via interfaces: Eth 10/100 Base-T; Eth 1000 Base-T, Eth 1000 Base-LX (1550 nm), G.703/G.704; S1-I (1,2; 2,4; 4,8 & 9,6 kbps).

## MOBILE SATELLITE COMMUNICATION TERMINAL STATION



### PURPOSE

Provide automated satellite communications via spacecrafts (hereinafter referred to as SC) for communication and broadcasting of civilian purposes located in the geostationary orbit, including foremost SCs of a broadband satellite communication network in Ku-band and C-band frequency for the setup of a digital high bit rate link, as well as a military SC for antijamming satellite communications of various control links in C-band, for the setup of fiber-optic and wired communication lines and deployment of data transmission networks.



### BASIC CHARACTERISTICS

Setup of the automated satellite communications:

- via Ku-band transponders in the back-to-back relay mode;
- via C-band transponders in the back-to-back relay mode.

Data transfer rate:

- in Ku-band back-to-back relay mode:		
transmit		at least 2,048 Mbps
receive		up to 225 Mbps
- in the mode of back-to-back relay of C-band		
1 stream with the data rate transfer		up to 2,048 Mbps
- in C-band mode with antijamming of 4 streams		
with the transfer data rate		1,2; 2,4; 4,8; 9,6 Mbps

### TASKS TO BE SOLVED

Operate in the modes of back-to-back relaying in Ku-band and C-band: SCPC; MCPS/SCPC; TDM(DVB-S2)/TDMA (MF-TDMA).

Process the external interfaces of C1-FL-BI, RS-232, RS232C, RS422, HDB3, OCK CH, OCK PN, V35, Ethernet 10/100 BASE TX, E1.

Possible performance with a help of TCP/IP protocol suite as well as backup of RTP protocol.

Setup of 4 (3 optic interfaces with the length wave of 1,55 and one interface with the length wave of 1,31) fiber-optic communication lines of STM-1 level by using the multiplexer of SMD synchronous access VIA a single-mode optic-fiber cable.

Setup of 4 Ethernet links by using SMD and transfer them in STM-1 structure with the rate of 91,392 Mbps; setup of 8 LAN streamlines to transfer Ethernet traffic by using four WAN streamlines; setup of four FXS terminals; setup of four VF wire links; setup of 37 E1 streamlines.

Setup of 2 Digital Communication Systems by applying Orion-3 modem which ensures simultaneous transmission of TDM-traffic (up to four E1 streams) and Ethernet 10/100 Base-T data with a total rate of 0,2 up to 15,2 Mbps or setup of the high-rate link for Ethernet 10/100 Base-T data transfer with the rate of 0,2 up to 15,2 Mbps per each pair of P-296 cable with the length up to 9 km.

Deployment of the perimeter safety alarm for 5 security sectors.

Connection of the external telecommunication equipment via the interfaces: Eth 10/100 Base-T; Eth 1000 Base-T, Eth 1000 Base-LX (1550 nm), G.703/G.704; C1-I (1,2; 2,4; 4,8 and 9,6 Mbps).

## SATELLITE COMMUNICATION TERMINAL STATION



**DRIVEAWAY STATION**

### PURPOSE

Ensure automated satellite communications via a spacecraft (hereinafter referred to as a Spacecraft) for civilian communication and broadcasting which is located in the geostationary orbit, including a forward spacecraft of the broadband satellite communication network in Ku-band and C-band frequency by providing of a digital high-speed link as well as a military SC with the setup of the antijamming satellite communications for various control links in C-band.

Automobile satellite communication terminal station is mounted on any armored transport base.

### BASIC CHARACTERISTICS

Setup of the automated satellite communication station (for driveaway station) /Setup of continuous duplex communication without manual search and frequency tuning (for automobile station) by means of:

- Ku-band relay station in the mode of back-to-back relaying
- C-band relay station in the mode of back-to-back relaying



**AUTOMOBILE STATION**

Data transfer rate:

- in the mode of back-to-back relaying in Ku-band:
  - transmit at least 2,048 Mbps
  - receive up to 20 Mbps
- in the mode of back-to-back relaying in C-band of a single streamline with the data transfer rate of up to 2,048 Mbps
- In C-band with antijamming performance 2,4; 4,8 kbps

### TASKS TO BE SOLVED

Performance in the mode of signal back-to-back relaying in Ku-band and C-band: SCPC; MCPC/SCPC; TDM (DVB-S2)/TDMA (MF-TDMA).

Processing of external interfaces - S1-FL-BI, RS232C, Ethernet 10/100 BASE TX, E1.

Performance via TCP/IP suite of protocols as well as backup of cRTP protocol.

Antenna automated guidance at a specified SC.

## S-BAND PORTABLE SATELLITE TERMINAL STATION



### PURPOSE

Ensure the automated satellite communications via civil/military communications and broadcasting spacecrafts located in the geostationary orbit including potential spacecrafts of the broadband satellite communications network in C-band frequency with the setup of antijamming for various control links.

### BASIC CHARACTERISTICS

Antenna diameter		0,6 m
Equivalent Isotropically Radiated Power		at least 37 Dbw
Receiving system Q-factor		2,8 dB/K
Number of links		1
Data transfer rates	2; 2,4; 4,8; 9,6; 16; 19,2; 32; 48; 64; 128; 256 kbps	
Antijamming	phase-manipulated pseudo-random signals (DSSS)	
Station deployment time		up to 10 minutes
Operating temperature range		from -400C up to +500C
Preservation temperature range		from -400C up to +500C
Interface terminals	S1-FL-BI, RS-232, TLF/ATS, Ethernet	
External network power supply	single phase AC, voltage - 220 <sup>+22</sup> <sub>-33</sub> V; frequency - 50 Hz	
	constant voltage - from 10,8 up to 30 V	
Power supply by a product storage battery		at least 4 hours
Power intake in the receive/transmit mode		up to 140 W

### TASKS TO BE SOLVED

Duplex encrypted phone communications, data transfer via a single digital link in the modes of link by providing the service on a subscriber request via back-to-back relay stations in radio-ATS networks with the decentralized control and (or) by providing links on request with the centralized control as well as via fixed communication links (streamlines).

Duplex phone, facsimile communications and data transfer via a single digital link in the modes of link by providing it on request or via a fixed communication link on communication services provided for the station subscribers.

Provide the digital link for videoconferencing.

Remote control at a range of up to 300 m.

### Ku-BAND PORTABLE SATELLITE TERMINAL STATION



#### PURPOSE

Ensure the automated satellite communications via civil/military communications and broadcasting spacecrafts located in the geostationary orbit including potential spacecrafts of the broadband satellite communications network in C-band frequency with the setup of antijamming for various control links.

#### BASIC CHARACTERISTICS

Antenna diameter	0,6 m
EIRP	at least 40,5 DBW
Receiving system Q-factor	11,1 dB/K
Ultimate data rate	at least 256 kbps
Station deployment time	up to 10 minutes
Operating temperature range	from -40 °C up to +45 °C
Preservation temperature range	from -40 °C up to +50 °C
Interface terminals	2 wire subscriber line, Ethernet

#### External network power supply

single phase AC, voltage -  $220^{+22}_{-33}$  V, frequency - 50 Hz  
constant voltage - from 11,8 up to 30 V

Power supply by a product storage battery	at least 4 hours
Power intake in the receive/transmit mode	up to 80 W

#### TASKS TO BE SOLVED

Duplex phone, facsimile communications and data transfer via a single digital link in the modes of link by providing it on request or via a fixed communication link on communication services provided for the station subscribers.

Provide the digital link for videoconferencing and IP-telephony.



**OJSC "AGAT - Control Systems" - Managing Company of  
"Geoinformation Control Systems Holding"**  
117 Nezavisimosti avenue, Minsk, 220114, Republic of Belarus  
Phone: +375 (17) 337 54 55; Fax: +375 (17) 374 24 50  
agat@agat.by

Marketing & sales department  
Phone: +375 (17) 305 90 66  
market@agat.by  
www.agat.by