Operation Manual

3G modem iRZ TU42-232

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1. Introduction

1.1. About this Document

The operation manual is intended for skilled PC users and provides the description and operating procedure of the iRZ TU42-232 3G modem.

1.2. Service Information

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1.3		18/07/2017	
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1.3. Safety Precautions

Restrictions on the router use near other electronic devices:

- Power off the modem in medical centres and keep it away from medical equipment (cardiac pacemakers, hearing aids). Medical equipment may be susceptible to any form of radio interference. In such areas the modem can transmit signals that could interfere with this equipment.
- Power off the modem in an aircraft. Take measures against accidental activation.
- Power off the modem near gas stations, enterprises of chemical industry, in areas where blasting operations are in progress. The modem can interfere with operation of technical devices.
- At close range the modem can interfere with television and radioreceiver operation.

To ensure safe operation, follow the recommendations:

- Do not expose the modem to aggressive influences (high temperatures, corrosive chemicals, dust, water, etc.).
- Protect the modem from impacts, falls and excessive vibration.
- Do not attempt to disassemble or modify the modem. Such actions will void the warranty.

Note: Use the device in compliance with the operating instructions. Damages caused by improper use and storage of the device are not covered by the warranty.

2. Overview

2.1. Purpose

The iRZ TU42-232 GSM modem is an industrial GSM modem designed for high-bandwith data and text messages transmission over GSM channel. The main features of TU42-232 are: Java™ support. The embedded Java platform offers easy and fast application development, a broad set of tools, high code reusability, easy maintenance, a proven security concept, on-device debugging, multi-threading programming and multi-application execution. The modem is controlled by standard AT commands. The terminal is equipped with the LEDs to monitor link status and abnormal conditions.

iRZ TU42-232 comes with a robust plastic housing. The modem can be mounted on DIN rail using mounting braket, thus making the mounting process easy and convenient. A widespread USB 2.0 interface enables the direct modem connection to a computer without an AC power adapter.

iRZ TU42-232 can be easily integrated into many M2M solutions: mobile access to the Internet, telemetry, wireless data collection from sensors and meters, remote viewing, management and alarm systems.

2.2. Package Contents

The iRZ TU42-232 GSM modem package includes:
- 3G modem iRZ TU42-232
- original package.

2.3. Specifications

General characteristics:
- Frequency bands:
    - 900/1800 MHz for GSM/GPRS/EDGE;
    - 900/2100 MHz for HSPA+/UMTS.
- Standards and data transmission rates:
    - HSPA+ download — 7,2 Mbps, upload — 5,7 Mbps;
    - UMTS PS download — 384 kbps, upload — 384 kbps;
    - UMTS CS download — 64 kbps, upload — 64 kbps;
    - EDGE Class 12, download — 236.8 kbps, upload — 236,8 kbps;
    - GPRS Class 12, download — 85,6 kbps, upload — 42,8 kbps;
- MS Class B;
- USSD;
- SMS: MT, MO, Text and PDU.

Parameters of open programming platform:
- Java™ ME 3.2
- memory: 6 MB (RAM), 8 MB (Flash);
- Secure data transmission with HTTPS and PKI support;

- Multitasking and multithreading, running several applets at once.

Power Supply:

- power voltage – 9 to 30V;
- when powered through USB, 5V;
- current consumption:
    - at a supply voltage of +12V – max 400 mA;
    - at a supply voltage of +24V – max 200 mA.

Physical Specifications:

- dimensions – max 69x75x26 mm;
- weight: max 125 grams;
- operating temperature: -40°C to +70°C;
- storage temperature: -40°C to +85°C.

Interfaces and Connectors:

- USB connector (type B) – data cable connection, USB 2.0 interface, modem power supply;
- Interface connector DB9-FF — connection of communication cable and RS232 interface;
- FME-M antenna connector — connection of the GSM antenna
- TJ6-6P6C power connector — modem power, reset signal.

2.4. Device View

3G modem iRZ TU42-232 is a compact device in a plastic casing. The device general view is given in Fig. 2.1 and Fig. 2.2

Fig. 2.1 **Front panel**

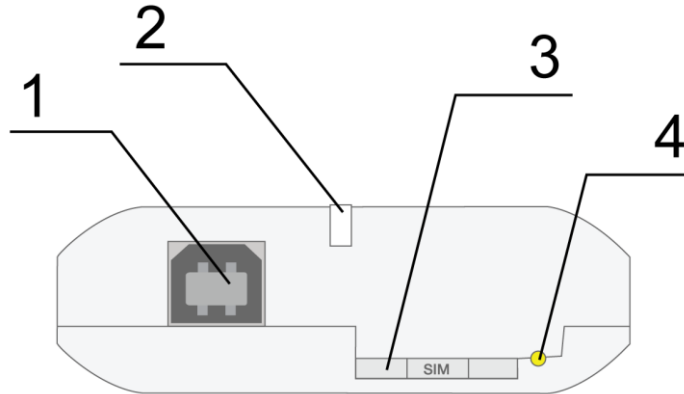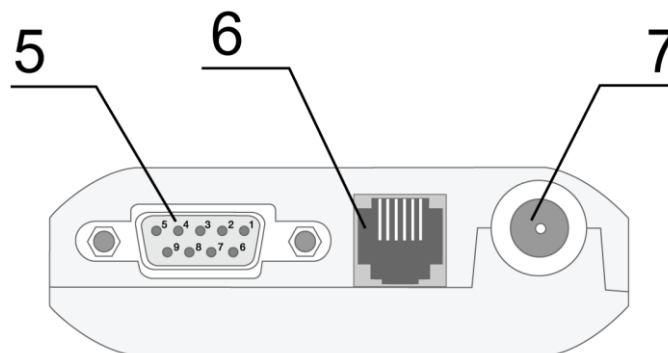Fig. 2.2 **Back panel**

The numbers in the figures illustrate:

1. USB connector (B type) – connection of communication cable.
2. LED status (green) and error (red) indicators.
3. SIM card tray.
4. Eject button for SIM card tray.
5. Interface connector DB9-FF, connections of communication cable.
6. Power connector TJ6-6P6C, power connection.
7. Antenna connector FME-M, connections of a GSM antenna.

2.5. Interfaces

2.5.1. Interface connector (RS232)

The DB9 connector is designed for connection to a control device via RS232 interface. Factory settings: connection speed of 115200 bps, 8-N-1. The view of the connector is shown in Fig. 2.5.1:
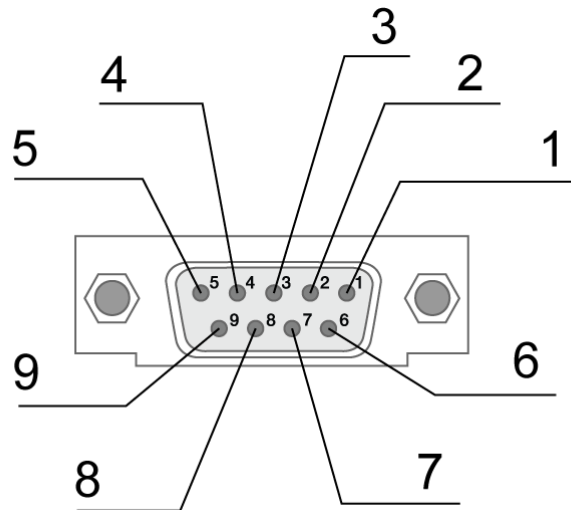
Fig. 2.5.1 **Interface connector**

Table 2.5.1 Interface connector's pin assignments

Pin	Signal	Direction	Function
1	DCD	Modem-PC	Carrier Detect
2	RXD	Modem-PC	Receive Data
3	TXD	PC-Modem	Transmit Data
4	DTR	PC-Modem	Data Terminal Ready
5	GND	Ground	System Housing
6	Not used		
7	RTS	PC-Modem	Request To Send
8	CTS	Modem-PC	Clear To Send
9	RI	Modem-PC	Ring Indicator

Pin assignments match serial interface with V.24 protocol.

Cable length must not exceed 1,8 m. It is not recommended to use transmission speed above 115200 bps.

Note: The RS232 (COM port) standard does not allow hot plugging.
To prevent damage to the modem's COM port, be sure to connect and disconnect devices after at least 5 seconds upon powering them off.

2.5.2. Power Connector

Main designation of TJ6-6P6C is connecting the modem's power supply. The modem is also fitted with emergency reset pin. The view of the connector is shown in Fig. 2.5.2
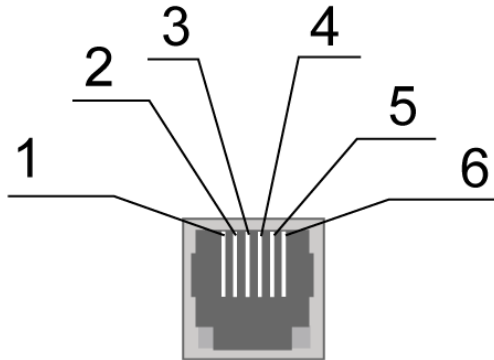
Fig. 2.5.2 **Power Connector**

Table 2.5.2 Power connector pin assignments

Pin	Signal	Function
1	Vcc	Positive terminal of constant power supply voltage.
2	GPIO4	Digital input/output, controlled by GPIO4 module's output. Parameters: V_{OL} max = 0.2V, V_{OH} min = 1.6V, V_{OH} max = 1.8V, V_{IL} max = 0.8V, V_{IH} min = 3.6V, V_{IH} max = 5.0V
3	Reset	Resetting the modem. For resetting the modem, send impulse at least 10ms long. V min = 2.0V, V max = 5.0V
4	ADC1	Analog-to-digital converter. Input circuit parameters: input impedance – 30 kΩ, input voltage divider by 10. connected to ADC 1 output of the GSM module. measurement range – from 0 to 10 V.
5	GPIO8	Digital input/output, controlled by GPIO8 module's output. Parameters: V_{OL} max = 0.2V, V_{OH} min = 1.6V, V_{OH} max = 1.8V, V_{IL} max = 0.8V, V_{IH} min = 3.6V, V_{IH} max = 5.0V
6	GND	Equipment case, ground.

2.5.3. USB connector

USB connector (B type) is used for connection to managing device via USB 2.0 interface. The view of the connector is shown in Fig. 2.5.3:

Fig. 2.5.3 **USB connector**
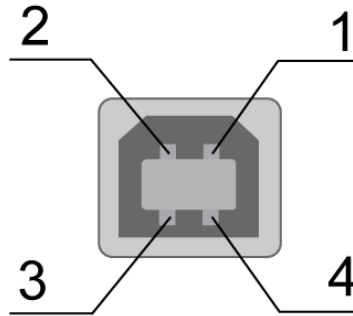
Table 2.5.3 USB connector pin assignments

Pin	Signal	Function
1	+5V	Modem power, consumption no more than 500 mA
2	D−	Transmit Data
3	D+	Transmit Data
4	GND	System Housing

2.6. Modem Status Indicators

Two LED indicators are used for displaying operation mode status or emergency situation. Indication can be controlled via AT command "AT^SLED". By default, the value is AT^SLED=2,50. LED indication modes for displaying operation modes are given in Table 2.6.1.

Table 2.6.1 Operation mode indication (green LED)

Status display mode	Schematic LED signals representation	Operating mode
Off	○	The modem is switched off or at fault condition; power-saving mode; "ALARM" mode
500 ms on / 500 ms off	●●●●●○○○○○	The modem is not registered to the network
50 ms on / 3990 ms off	●○○○○○○○○○○○○○○...○	The modem is registered on the network
50 ms on / 1990 ms off	●○○○○○○...○	GPRS connection established / Data transmission in progress (GPRS)
250 ms on / 250 ms off	●●●○○○	Programming mode, menu mode
50 ms on / 990 ms off	●○○...○	Voice call, CSD

Table 2.6.2 Fault condition indication (red LED)

Status display mode	Schematic LED signals representation	Fault description
Continuously lit	●	Wrong input voltage
0,25 s on / 0,25 s off / 0,25 s on / 1 s off	●○●○○○○	GSM module failed to start
0.5 s on / 0.5 s off	●○	Wrong module power

Emergency situations are described in section 5 of this document.

3. Connection, configuration and control

3.1. Connecting, operating mode

All installation operations are to be carried out by a qualified specialist familiar with the installation guide.

Before supplying power, install the SIM card into the modem. The following actions are required:

- Remove a SIM card tray pressing the eject button (see Fig. 2.1).
- Insert a SIM card into the SIM card tray.
- Insert SIM tray into the modem.

Do not apply much force when inserting a SIM card. Connect a GSM antenna and a switching cable. Modem is fitted with USB interface for connecting to the controlling device: RS232 and USB. Control can be carried out via both interfaces simultaneously.

Turn the modem's power supply on via power connector (see Fig. 2.5.2). When operating via USB interface, simply connecting USB cable is enough After power supply is connected, the modem will start. This will be indicated by green LED (see Table 2.6.1). If PIN code is switched off, registration within network will occur automatically.

> **Note:** A GSM antenna, switching cables and a power supply unit are not included.

When operating via USB interface, it is required to install a driver on your PC. You can download the driver from www.radiofid.ru and www.irz.net websites. After installation of the driver, several new devices are to be displayed in the Windows Device Manager.

- cinterion EHx USB Modem in the Modems section;
- several Cinterion EHx USB COM Port ports in the Ports section;
- cinterion EHx USB COM Port 3 – port for displaying service menu

3.2. Control, Reset and Power Off

The connection of iRZ TU42-232 3G modem to Internet and its configuration via PC is carried out in the same way as with a standard modem. It is recommended to set module speed for RS232 interface to 115200 bps and select modem's model in the connection. Standard speed is 33600 bps. For industrial applications modem control is carried out via standard AT commands. You can download the description of AT commands from www.radiofid.ru and www.irz.net websites.

You can reboot the modem in the following ways:

- by 8 switches of DTR COM port to passive state (DTR < -2V), pulse length and pauses between pulses must lay within 100-500 ms range;
- by sending a positive pulse (10 to 20 V) no shorter than 50 ms to power connector's pin No.4 (see section 2.5.2);
- reboot after a set period of time (WD interval, switched off by default). Configured in the Menu mode;
- by AT command "AT+CFUN=1,1";
- by temporary powering off.

The modem can be switched off by:

- by AT command "AT^SMSO";
- by powering off.

Switching to power saving mode is done with AT command "AT+CFUN". For more details, see description of AT commands for GSM module.

3.3. Menu mode

Menu mode's funtion is to change the modem parameters and access statistics. Switching to Menu mode is possible from Operation mode. To switch to Menu mode, eject the SIM tray. Before accessing the menu mode connect the modem to the computer (Cinterion EHx USB Com Port3), run Hyper Terminal or a similar program to communicate with the modem.

The modem will go into the menu mode:

```
Menu mode:
Variant XX
<P1> View statistic
<P2> WD interval = OFF
<PC> Power control
<PR> Clear statistic
<PG> Work mode = OFF (0)
```

Variant XX – firmware version.

The **<P…>** characters indicate the control commands. To run a command, press the **Enter** key. If the command is incorrect, the ERROR message is displayed. The command input is case-insensitive.

"**P1**" command will switch to statistics mode:

Statistics:
Power_Modem = XXX
Bad_Power_Modem = XXX
Power_Module = XXX
Bad_Power_Module = XXX
Reset = XXX

where:

Power_Modem – the number of the modem actuations;

Bad_Power_Modem – the number of power deviations of the modem;

Power_Module – the number of times power GSM module's switched on;

Bad_Power_Modem – the number of power deviations of the GSM module;

Reset – the number of resets.

After displaying statistics, the modem will switch to Main Menu

"**P2**" command will switch to WD mode:

WD interwal,hh (WD OFF: hh=0, max: hh=255)
<Q> Quit
WD interval =

This sets the time interval for module restart. For changing this interval, enter number from 0 to 255 and press "Enter" key. Interval is set in hours. To disable this function enter 0. Please note, that the modem will be forced to restart after interval expiration. If entry is incorrect, "ERROR" message will be displayed and you will be redirected to WD menu again. If entry is correct or after entering "**Q**" command, you will be redirected to Main menu.

Entering the "**PC**" command allows reviewing the control voltages of the module (measurement precision 5%):

If the modem is powered via power connector, then

POWER Uin: 12.0 Umd: 4.0 V

If the modem is powered via USB, then

POWER Uin: USB
Umd: 4.0 V

where **Uin** — input voltage (V), **Umd** — GSM module voltage (V).

After displaying data, the modem will switch to Main Menu

"**PR**" command will switch to statistics reset menu:

Clear statistic?
<Yes> Yes
<Q> Quit

Reset the accumulated statistics by "**YES**" command. If entry is incorrect, "ERROR" message will be displayed and you will be redirected to Statistic menu again. If entry is correct or after entering <**Q**> command, you will be redirected to Main menu.

"PG" command will switch to modem work mode menu:

Work mode (0-OFF, 1-3G pref, 2-2G pref, 3-3G only, 4-2G only)
<Q> Quit
Work mode =

Work mode of the modem is set. For changing the modem's work mode enter:

0 – OFF, work mode selection is enabled;

1 – 3G pref, priority is given to working with 3G networks;

2 – 2G pref, priority is given to working with 2G networks;

3 – 3G only, working with 3G networks only;

4 – 2G only, working with 3G networks only (must be set for CSD call).

To run a command, press the **Enter** key. If entry is incorrect, "ERROR" message will be displayed and you will be modems' work mode menu again. If entry is correct or after entering <Q> command, you will be redirected to Main menu.

Entering "**M**" command switches to back Main menu. You can exit the Menu mode by inserting the SIM tray; the modem will switch to Operation mode. Close the port before inserting the SIM tray.

4. Creating, Installing and Removing Java Based Applications

This modem is built on EHS5 module with integrated Java platform, which allows to perform numerous tasks. You can create, install and delete Java applications via special tool "Module Exchange Suite" (MES) by Cinterion Company. This software can be found on our website www.radiofid.ru. Alternatively you can order Software CD from our managers.

After installing "Module Exchange Suite", new disk named "Module" should appear on your PC.
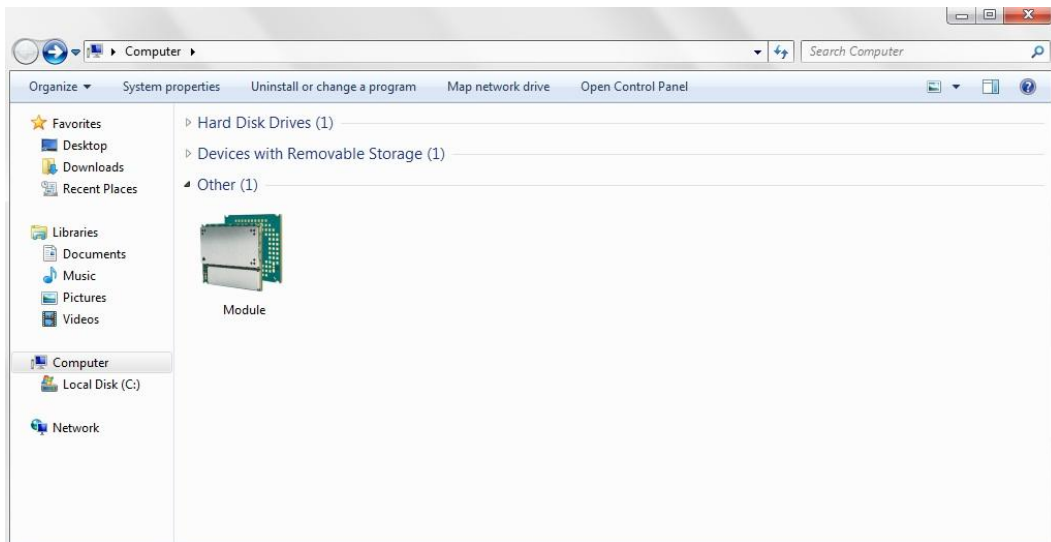

Fig. 4.1 **My Computer Window in Windows 7**

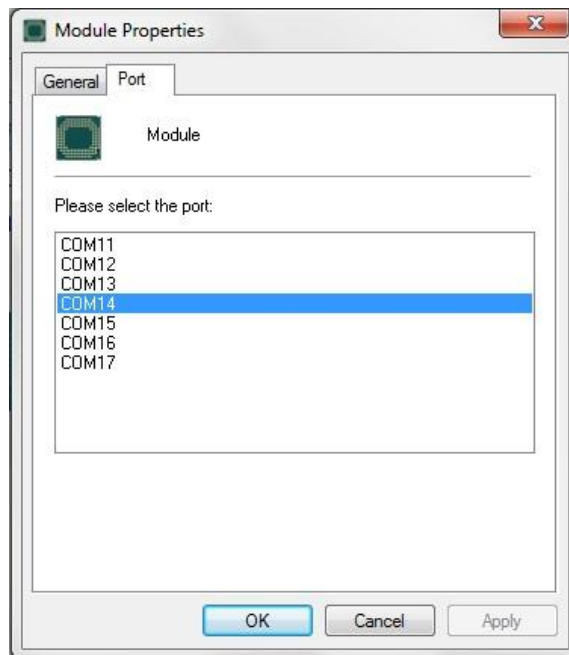In Disk properties ("Port" tab) select COM-port to which the modem is connected.

Fig. 4.2 **Selecting the Required COM Port**

"Module Exchange Suite" writes and deletes files from "Module" disk. For example, to install Java application, just copy programm's files to "Module" disk and send AT command AT^SJAM=0,"a:/HelloUniverse.jad","" .

Java application's autostart is set using the following AT commands:

- AT^SCFG="userware/autostart/delay","","100" (autostart initiates in 10 seconds after module was switched on);
- AT^SCFG="userware/autostart","","1" (autostart enabled).
- AT^SJAM=0,"a:/HelloUniverse.jad","" – (install an application into the module's memory)

  Also you need to add the following lines into the .jad file:

  Oracle-MIDlet-Autostart: n (numerical number of midlet at launch, its value range is 0...5 "0" indicates that autostart is disabled)

  Oracle-MIDlet-Restart: true (restart the midlet in case of incorrect termination).

  Oracle-MIDlet-Restart-Count: m (figure representing number of times the application may be restarted before restarting the module).

It is recommended to set autostart interval to ~10 seconds. It is especially important when testing new Java applications, since it simplifies the procedure of autostart disabling. After Java application autostart, port(s) may not react to AT commands.

For deleting Java application disable its autostart via AT^SJAM=2,"a:/HelloUniverse.jad","″ AT command. It requires a sufficient autostart interval set in advance, or having a port that responds to AT commands available and not used by running Java applications. It is recommended to send this AT command after 2-5 seconds after powering up the modem. If there is a port not used by running Java applications, AT command may be sent at any moment. After AT command was successfully sent, modem gives a reply: "OK". Now you should send command AT^SJAM=3,"a:/HelloUniverse.jad","" – delete application. Note that .jar and .jad files will not be deleted from internal memory - you can delete them manually via MES.

Deleting Java applications means deleting files on "Module" disk. Also, there is an option to remotely update Java application – "Over The Air Provisioning" (OTAP). For more detailed information, address documentation on Development Software CD.

5. Emergencies

To facilitate the use of the modem, tracking and display of emergencies are provided.

5.1. Emergency 1 (incorrect input power supply)

Emergency 1 occurs when the controlling internal voltage deviates from the permissible value. The modem stops operating: and switches off GSM module power supply. Emergency is indicated by continuously lit red LED. The recovery is possible only when the controlling internal voltage is re-established.

5.2. Alarm 2 (incorrect module power supply)

Emergency 2 occurs when GSM module's' power supply deviates from the permissible value. The modem stops operating and switches off GSM module power supply. A red LED signals that the emergency has occurred (0.5s on / 0.5s off). The recovery is possible only if the module power supply is re-established within 10 seconds after the emergency has occurred. If within 10 seconds the module power supply remains incorrect (with a correct input power supply), the modem goes into the waiting mode meaning that the modem's power supply is turned off, the emergency indication is preserved. The waiting mode can be terminated only after the power is completely disconnected.

5.3. Emergency 3 (GSM module failed to run)

Emergency 3 occurs if the GSM module does not turn on or is absent. A red LED signal (0.25s on / 0.25s off / 0.25s on / 1s off) turns on after the modem precisely detects the emergency situation (~15 sec). The recovery is possible only after a successful launch of the GSM module. After 10 unsuccessful attempts to launch the module, the modem goes into the waiting mode. The modem's power supply is turned off, the emergency indication is preserved. The waiting mode can be terminated only after the power is completely disconnected.

In case of repeated emergency, the modem should be serviced.

6. Support

To get updated documents and software updates, please use the following contacts:

St. Petersburg	
The company's website:	www.radiofid.ru
Phone number in St. Petersburg:	+7 (812) 318 18 19
E-mail:	support@radiofid.ru
Moscow	
The company's website:	www.digitalangel.ru
Phone number in Moscow:	+7 (495) 974 74 22
E-mail:	info@digitalangel.ru

Our specialists are always ready to answer your questions, assist in installation, configuration and resolve difficulties with using the iRZ equipment.

> **Note.** Before contacting technical support it is recommended to update your router firmware up to a current version.