

# USER GUIDE GSM modem **iRZ ES90iPU**





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## 1. Introduction

### 1.1. Document description

This manual is intended for experienced PC users. It describes the device and the operation of the GSM modem iRZ ES90iPU.

### 1.2. Service data

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1.0.6		06.26.2015	
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### 1.3. Safety rules

Restrictions on the use of the device near other electronic devices:

- Turn the modem off in hospitals or when located near medical equipment such as pacemakers, hearing aids and so on. Interference for medical equipment may occur
- Turn the terminal off when on an airplane. Take measures to avoid accidental turning on
- Turn the modem off in the vicinity of gas stations, chemical plants, and places where demolition work is conducted. Interference for technical devices may occur
- At a close range, the modem may produce interference for television sets and radio transmitters

Maintenance requirements:

- Protect the modem against external hazards (high temperatures, caustic chemicals, dust, water and so on)
- Keep the modem safe from blows, falls, and strong vibrations
- Do not attempt to take apart or modify the modem on your own. Such actions will void your warranty

**Note:** Make sure you follow the operation manual for this device. Improper use of the device will disqualify your warranty.



## 2. General Information

### 2.1. Purpose

The 3G modem iRZ ES90iPU is an industrial GSM modem for receiving and transmitting data via GSM channel. It is perfectly suited both for providing mobile access to the Internet and for industrial applications including telemetry, wireless data collection from sensors, remote monitoring, control, and signaling.

The modem is equipped with a watchdog timer, which allows for an unconditional reboot of the equipment after a specified period of time. The modem is controlled by standard AT-commands and also possesses its own range of control commands. The device is equipped with LEDs to monitor connection status and signal for emergency.

### 2.2. Set

The set of the iRZ ES90iPU GSM modem includes:

- ES90iPU terminal;
- Factory package.

### 2.3. Features

Key features:

- Frequency bands:
  - 850/900/1800 MHz (GSM/GPRS/EDGE);
  - 900/2100 MHz (HSDPA/UMTS);
- Output power:
  - 33 dbm (class 4) for GSM850 and EGSM900;
  - 30 dbm (class 1) for GSM1800;
  - 27 dbm (class E2) for GSM850/900 8-PSK;
  - 26 dbm (class E2) for GSM1800 8-PSK;
  - 24 dbm (class 3) for WCDMA 900/2100;
- Standards and data transfer speed:
  - HSDPA speed — 3.6 Мбит/с;
  - UMTS speed — 384 kbps (R99);
  - UMTS PS receive speed — 384 kbps, transmit speed — 384 kbps;
  - EDGE class 12, receive speed — 236.8 kbps, transmit speed — 236.8 kbps;
  - GPRS class 12, receive speed — 85.6 kbps, transmit speed — 42.8 kbps;
- MS class B;
- USSD;
- SMS: MT, MO, text, PDU;



#### Power:

- Power supply, 9V to 27V;  
supply from USB, 5V;
- Consumption current not exceeding:
  - with the supply voltage of +12V — 400mA;
  - with the supply voltage of +24V — 200mA;

#### Physical characteristics:

- Dimensions not exceeding 69 x 75 x 26 mm;
- Weight not exceeding 125g;
- Operating temperature range: -30°C ... +60°C;
- Storage temperature range: -50°C ... +85°C;

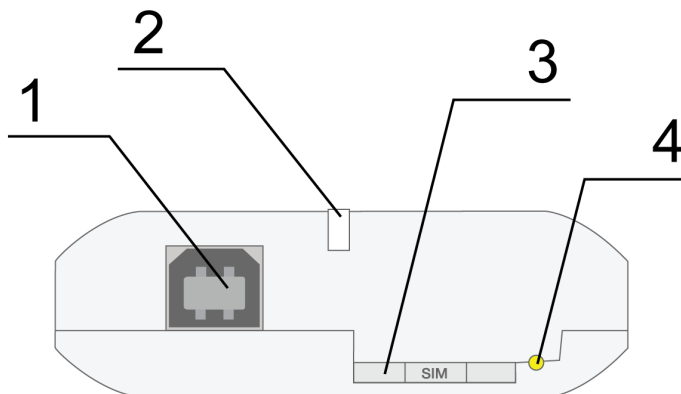
#### Interfaces and connectors:

- USB 2.0 connector (type B) – data transfer, power supply;
- TJ6-6P6C for RJ12 power connector;
- FME-M antenna connector – connect GSM antenna;
- TJ6-6P6C for RJ12 power connector – power supply, reset signal.

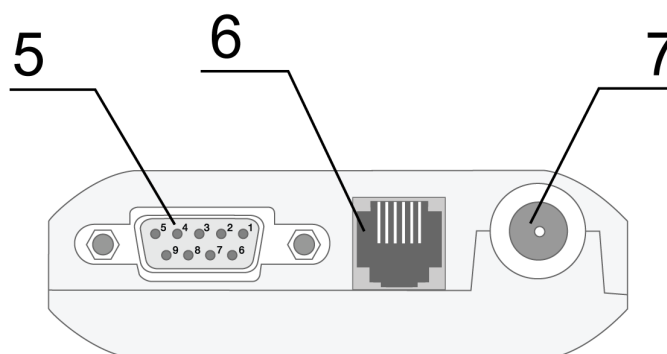


## 2.4. Appearance

ES90iPU modem is a compact device in a plastic case. Its appearance is displayed on Fig. 2.1 and Fig. 2.2.



**Fig. 2.1.** Front view



**Fig. 2.2.** Back view

The numbers on figures stands for:

1. USB 2.0 connector (type B) – connect communication cable;
2. LED: status (green) and emergency (red);
3. SIM card holder;
4. SIM card eject button;
5. DB9-F interface connector – connect communication cable;
6. TJ6-6P6C power supply;
7. FME-M antenna connector – connect GSM antenna.

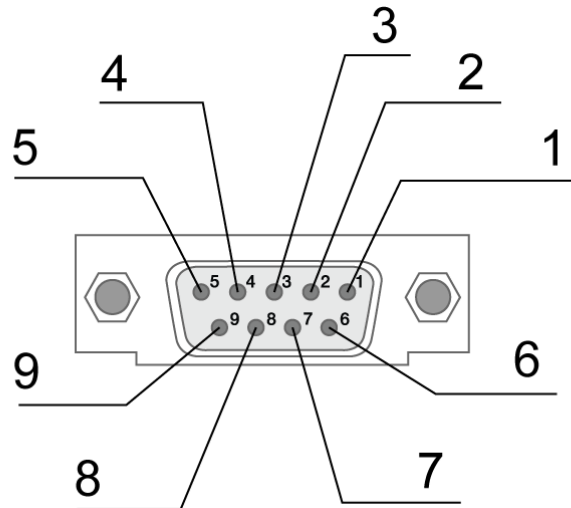


## 2.5. Interfaces

### 2.5.1. Interface connector (RS232)

This connector is used for connecting to the control device using the RS232 exchange protocol.

Factory settings: Speed is set to 115200 bps, 8-N-1. The appearance of the connector is displayed on Fig. 2.5.1:



**Fig. 2.5.1.** Interface connector

**Table 2.5.1:** Using DB9 connector pins

Pin	Signal	Direction	Purpose
1	DCD	Modem-PC	Presence of the carrier
2	RXD	Modem-PC	Data receive
3	TXD	PC-Modem	Data transmit
4	DTR	PC-Modem	Readiness for data reception
5	GND	General	Ground
6	not used		
7	RTS	PC-Modem	Request to transmit
8	CTS	Modem-PC	Readiness for data transmit
9	RI	Modem-PC	Call signal

he purpose of pins is consistent with the serial interface with V.24 protocol.

The length of the cable is not to exceed 1.8 m. It is recommended to set data transfer speed that does not exceed 115200 bit/s.

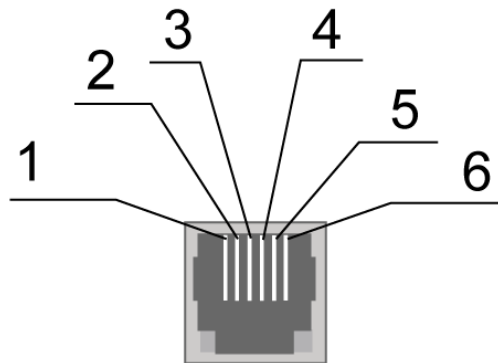
**Attention:** RS232 standard (COM-port) does not support a "hot" connection.  
To avoid damaging the COM-port of the modem connect and disconnect the device at least 5 seconds after the power of the connecting devices has been turned off.





### 2.5.2. Power connector

The connector TJ6-6P6C is used to power the device. One of the pins is used to reset the modem.



**Fig. 2.5.2.** Power connector

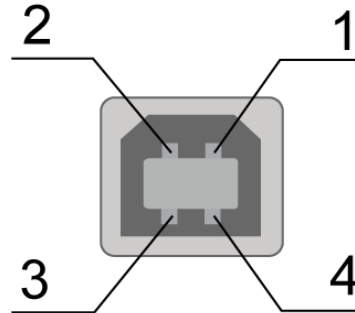
**Table 2.5.2:** Using connector power pins

Pin	Signal	Purpose
1	+Vin	The positive pole of DC supply voltage. Fused circuit and overvoltage protection (when input voltage of over 27V is applied) and reverse polarity. Range of supply voltage is 9V ... 27V
2	Not used	
3	RESET	To reset the modem send a positive impulse (from 10V to 20V) at least 50ms in duration
4	Not used	
5	Not used	
6	GND	Ground



### 2.5.3. USB Connector

Connector USB (type B) is used for connection to controlling the device, USB 2.0 interface.



**Fig. 2.5.3.** USB connector

**Table 2.5.3:** Using USB connector pins

Pin	Signal	Purpose
1	+5V	+5 V (can be used to power the modem, see details in Chapter 3)
2	D-	Data transmission
3	D+	Data transmission
4	GND	Ground



## 2.6. Modem status display

LEDs are used to indicate the connection status or emergencies. Management of indication operate can be controlling by "AT+CGFUNC" AT-command (AT+CGFUNC=1,1 - LED mode on; AT+CGFUNC=1,0 - LED mode off). By default, AT+CGFUNC=1,1 (LED mode off). For more information see tables 2.6.1 and 2.6.2.

**Table 2.6.1:** Connection status LED (green)

LED mode	Conditional indication display	Operation mode
Turned on	○	Modem is turned off/emergency
Permanently turned on	●	Network search/voice call
800ms on / 800ms off	●●●○○○	Modem is logged to the network
200ms on / 200 ms off	●○	Data transfer in progress
0.25s on / 0.25s off	●○	Service mode (programming mode, menu mode)

**Table 2.6.2:** Emergency LED (red)

LED mode	Conditional indication display	Operation mode
Permanently turned on	●	Invalid input voltage
0.25s on / 0.25s off / 0.25s on / 1s off	●○○○○○	GSM module has not launched
0.5s on / 0.5s off	●○	Invalid module power supply

For description of emergencies see chapter 4.



## 3. Connecting, configuring and management

### 3.1. Connecting, operating mode

Only individuals with specialized technical training and those who have studied the product specifications are permitted to assemble (install) the modem.

Before connecting the device insert the SIM card into the modem. In order to install the SIM card do the following:

- Eject the SIM holder by pressing the SIM card holder ejector button (Fig. 2.1);
- Place the SIM card into the SIM card holder;
- Insert the SIM card holder with the SIM card into the modem.

Be careful when installing the SIM card. Connect the GSM antenna and the commuting cable. Modem has two interfaces to connect control device: RS232 and USB. The modem can be controlled by both interfaces simultaneously.

Power the modem with the power connector (Fig. 2.5.2). When using the USB interface you need only connect the USB-cable. The frequent blinking of the green LED indicates that the modem is turned on (Table 2.6.1). Remove the PIN code of the SIM card to complete automatic online registration.

**Note:** GSM antenna, commuting cables and the power supply unit are not included in the set.

To work with USB interface, install USB driver on your PC. USB driver you can find at [www.irz.net](http://www.irz.net). After installing the driver should you see several ports on your PC:

- SimTech HS-USB Modem 9000 — the main port for management with AT-commands and data transferring;
- SimTech HS-USB AT Port 9000 — the port for management with AT-commands, if the main port is transfer data;
- SimTech HS-USB Diagnostics 9000 / SimTech HS-USB NMEA 9000 — service ports.

With removed SIM card's PIN code, the network registration is automatic.



### 3.2. Management, rebooting and turning off

Connecting and configuring iRZ ES90iPU modem to access the Internet from your PC is same as for a standard modem. If you using RS232 interface, select “standard modem 33600 bps”. For modem management with industrial applications, use standard AT-commands. Description of AT-commands can be downloaded from the website [www.irz.net](http://www.irz.net).

The modem can be rebooted using one of following ways:

- eight transitions of the DTR COM-port line into a passive state ( $DTR < -2V$ ); the duration of the impulses and pauses between the impulses should remain within the range of 100-500 ms;
- applying a positive pulse (10 V to 20 V), the duration of at least 50 ms to 4 pin of power connector (Section 2.5.2);
- rebooting after a given period of time (WD interval, turned off by default), setting is done in the menu mode;
- by using AT-command “AT+CFUN=1,1”;
- temporary power shutdown.

Turning on the modem:

- by using AT-command “AT+CPOF”;
- power shutdown.

AT-command “AT+CFUN” is turn on energy-saving mode of the modem. For more detail see AT-commands description for the GSM module.

### 3.3. Menu mode

The menu mode’s function is to change the modem’s parameters and access the statistics. In this menu, the power of the GSM module is switched off. After leaving the menu mode automatic rebooting takes place. The menu mode can be accessed from the operation mode. Before accessing the menu mode connect the modem to the computer (speed: 115200 bit/sec, 8-N-1), run Hyper Terminal or a similar program to communicate with the modem.

The modem will go into the menu mode:

Menu mode:

Variant PU-05

<P1> View statistic

<P2> WD interval = OFF

<PC> Power control

<PR> Clear statistic



**Variant XX** — software version.

Symbols <P...> stand for control commands. A command is sent after pressing “Enter”. If an incorrect command has been sent, the “ERROR” message appears. Entering commands is case-insensitive.

After entering the “**P1**” command a transition into the submenu of statistics occurs:

Statistics:

Power\_Modem = XXX

Bad\_Power\_Modem = XXX

Power\_Module = XXX

Bad\_Power\_Module = XXX

Reset = XXX

where is:

**Power\_Modem** — number of times the modem has been turned on;

**Bad\_Power\_Modem** — number of times the modem power supply has deviated from the allowed;

**Power\_Module** — number of times the power supply of the GSM module has been turned on;

**Bad\_Power\_Module** — number of times the modem power supply has deviated from the allowed;

**Reset** — number of resets.

After the statistics appears the transition to the main menu occurs.

Use “**P2**” command to proceed to the WD submenu:

WD interval,hh (WD OFF: hh=0, max: hh=255)

<Q> Quit

WD interval =



To change the reboot interval, enter a number from 0 to 255 (by pressing “Enter”). The reboot interval is set in hours. If you need to switch off this function enter 0. Keep in mind that after the set interval expires, the unconditional reboot of the modem will occur. In case incorrect information is entered the modem displays “ERROR” and offers the WD submenu once again. In case correct information is entered or **<Q>** command is sent a transition into the main menu takes place.

After input of the **<PC>** command – you can view the control voltage (accuracy of measurement 5%):

If the modem power supply from the power connector, then

POWER Uin: 11.7 Umd: 3.8 V

If the modem power supply from the USB connector, then

POWER Uin: USB

Umd: 3.8 V

where **Uin** — control internal voltage, **Umd** — voltage (V) to GSM module.

After the output a transition into the main menu occurs.

After entering the “**PR**” command a transition into the submenu of clearing the statistics occurs:

Clear statistic?

**<Yes>** Yes

**<Q>** Quit

The accumulated statistics is cleared by the **<YES>** command. In case incorrect information is entered the modem displays “ERROR” and offers the submenu of clearing the statistics once again. In case correct information is entered or **<Q>** command is sent a transition into the main menu takes place.

After entering the **<M>** command the main menu appears.

The exit from the menu mode occurs after the SIM-tray is installed back again. The modem goes into the working mode.

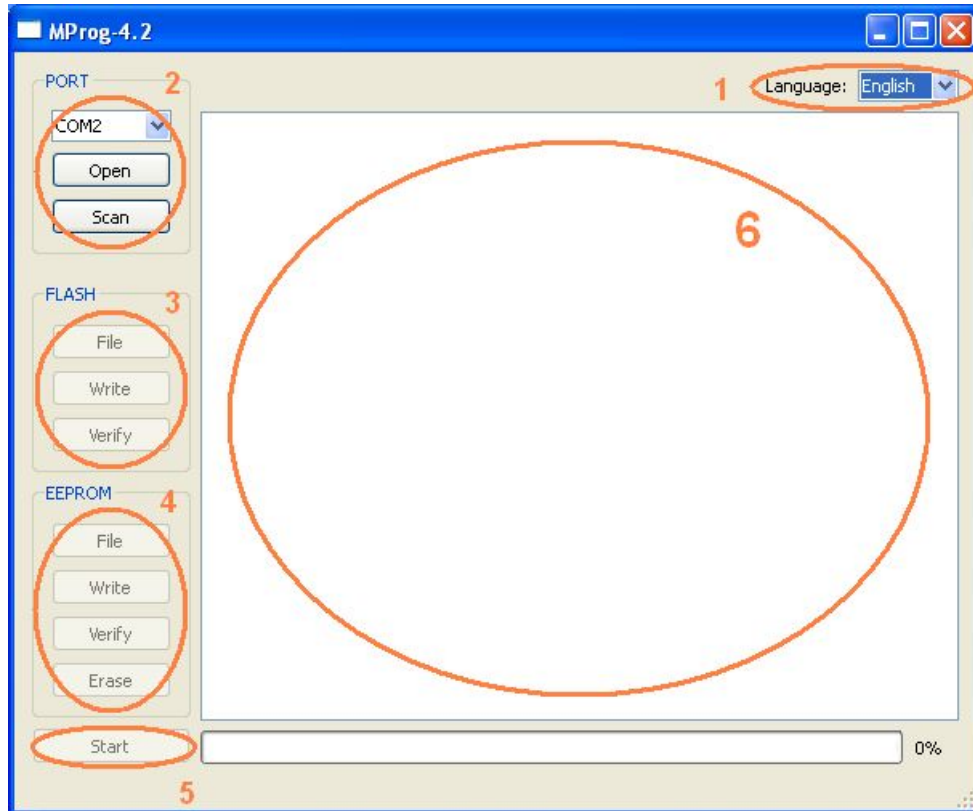


### 3.4. Programming mode

Program “mprog” is used to change or update software of the managing microcontroller of the modem.

Figure 3.1 shows an external view and main features:

1 – language, 2 – working with ports, 3 – working with Flash, 4 – working with EEPROM, 5 – start button, 6 – view window.



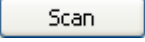
**Fig. 3.1.** Main view

If within 10 seconds after powering the device an update has not started, the modem will leave the programming mode and enter the menu mode.

To change the software do the following:

1. Start the program

Close all programs, which can use the port you will connect to the modem.

2. Click the  button in “Port” frame;
3. Choose the number of the COM port where the modem will be connected
4. Connect the modem (without the SIM holder) to the computer and turn on the modem;

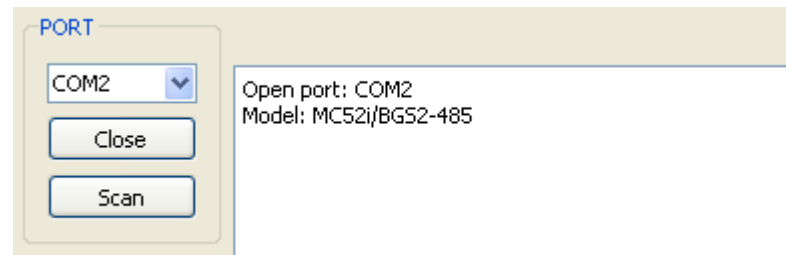
Turn on the modem. The modem will go into the programming mode. The green LED will blink: 250ms on / 250ms off. “Open” button (not later than 10 sec once the modem was powered).





- Click the **Open** button (not later than 10 sec once the modem was powered) in "Port" frame;

The device model should appear. For example see figure 3.2 – "MC52i-485" (or "BGS2-485").

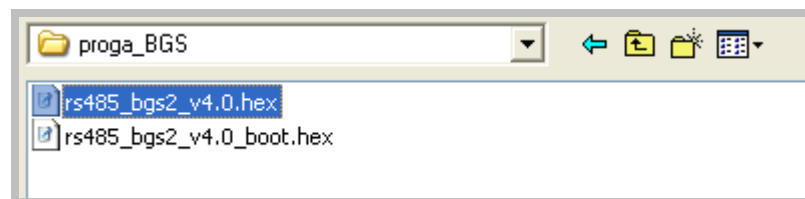


**Fig. 3.2.** Port opening

Then select the new firmware file to be downloaded.

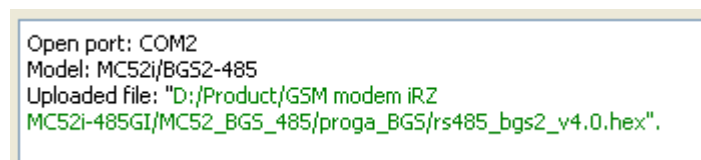
- Click the **File** button in "Flash" frame and choose firmware file (file in "hex"-format) in «Open file» dialog

For example see figure 3.3 – "rs485\_bgs2\_v4.0.hex".



**Fig. 3.3.** File uploading

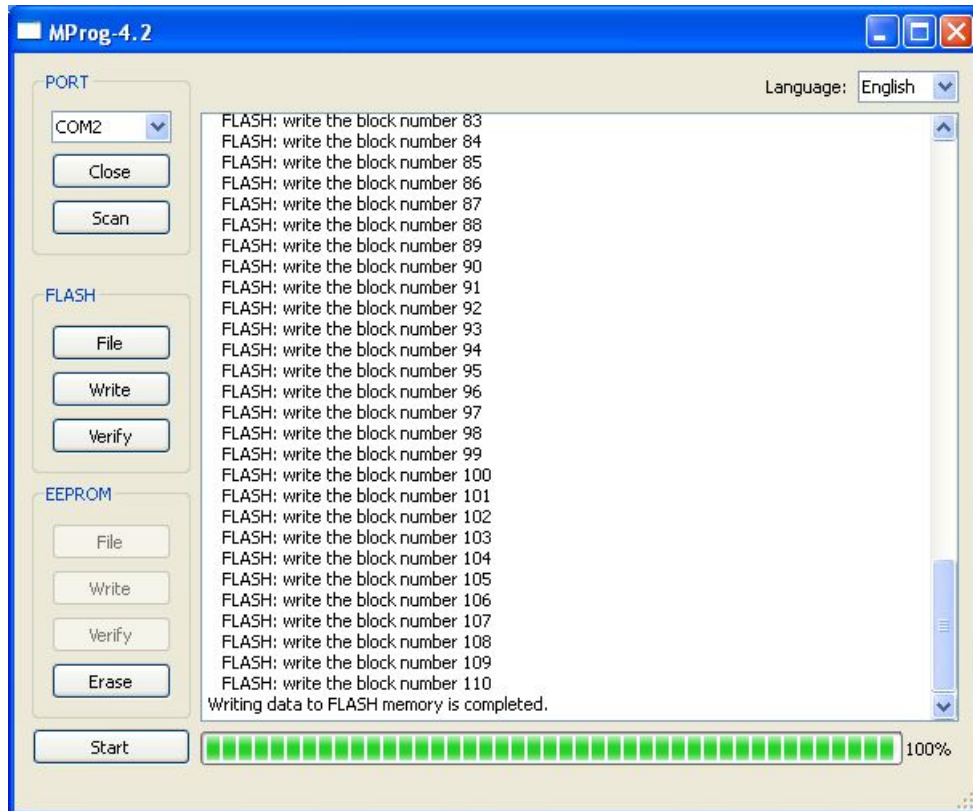
If the file has uploaded successfully, the program window will show message "Uploaded file:".




**Fig. 3.4.** File is uploaded

- Click the **Записать** button in "Flash" frame

After this, data will be written in Flash-memory and you see such text:



**Fig. 3.5.** Flash-memory writing

8. Next click the  button in bottom part of program window;  
This will make the modem exit from programming mode and the port will be closed.

```
FLASH: write the block number 107
FLASH: write the block number 108
FLASH: write the block number 109
FLASH: write the block number 110
Writing data to FLASH memory is completed.
Exit the programming mode.
Close port: COM2
```

**Fig. 3.6.** Exiting program mode

9. Close the program  
10. Place the SIM holder into the modem  
The software update is completed. The modem goes into the work mode.



## **4. Emergencies**

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

### **4.1. Emergency 1 (incorrect input power supply)**

Emergency 1 occurs when the input power supply deviates from the permissible value. The modem stops working and it shuts down the GSM module power. A permanent red LED signals that the emergency has occurred. The recovery is possible only when the input power supply is re-established.

### **4.2. Emergency 2 (incorrect module power supply)**

Emergency 2 occurs when the GSM module power supply deviates from the permissible value. The modem stops working and it shuts off the GSM module power. 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 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.

### **4.3. Emergency 3 (GSM module failed to start)**

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 a precise determination by the modem of 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 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.

In case of repeated emergency after the modem is turned back on, the modem should be serviced.



## 5. Support

New document versions and software are available using:

St. Petersburg	
The company's website:	<a href="http://www.radiofid.ru">www.radiofid.ru</a>
Phone number in St. Petersburg:	+7 (812) 318 18 19
E-mail:	<a href="mailto:support@radiofid.ru">support@radiofid.ru</a>
Moscow	
The company's website:	<a href="http://www.digitalangel.ru">www.digitalangel.ru</a>
Phone number in Moscow:	+7 (495) 974 74 22
E-mail:	<a href="mailto:info@digitalangel.ru">info@digitalangel.ru</a>

Our support team is ready to assist you with any questions you might have when installing, configuring or solving issues with our equipment.