

ALARM MONITORING & CONTROL SYSTEM TBox20 USER'S MANUAL

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CONTENT

1.	INTRODUCTION	4
2.	TECHNICAL SPECIFICATION	4
3.	MECHANICAL INTEGRATION	4
3.1.	PACKAGE CONTENTS	4
3.2.	DIMENSIONS	4
3.3.	FRONT PANEL	5
4.	CONNECTORS PIN_OUT	6
4.1.	CONNECTORS FRONT UP PIN-OUT	6
4.2.	CONNECTORS FRONT DOWN PIN-OUT	6
4.4.	SAMPLE ELECTRICAL CONNECTION	7
5.	INSTALATION AND STARTING	8
5.1.	INSTALLING A SIM CARD	8
5.2.	DIP SWITCH SETTINGS	9
5.3.	CONNECTION TO PC	9
6.	DATA CONFIGURATION	10
6.1.	APPLICATION'S LOGICAL ELEMENT	10
6.2.	FUNCTIONS	11
6.3.	LOGICS	11
6.4.	EVENTS	12
6.5.	ACTIONS	14
6.6.	USERS	16
6.7.	SETTINGS	17
6.8.	TEST	18
6.9.	STATUS	19
6.10.	LOG	19
7.	SUPPORT	20

1. INTRODUCTION

TBox20 is a compact monitoring and control device for remote objects with support for Short Messages (SMS). The device is configurable through internal WEB server interface via GSM network and RS232 interface. Multiple users can interrogate TBox20 or be notified on configurable events.

2. TECHNICAL SPECIFICATION

- Power 24V $\pm$ 10% (for the model TBox20-2401)
- Wireless modem: Quad Band GSM (850/900/1800/1900MHz)
- 4 digital inputs ("0" (false) 0 – 1V, "1" (true) 2-24V, terminal blocks)
- 2 analog inputs. (0 – 10V max 15V, 0-20mA max 30ma, terminal blocks)
- 4 relay outputs (~250V, 7A, terminal blocks)
- Interfaces RS232 (RJ45 connector) and GSM GPRS (antenna MMCX connector)
- Alarm message service via SMS, E-Mail
- Protocols HTTP and SMTP
- Configurable through internal WEB server interface
- Watchdog controller
- Operating temperature range from -20°C to +55°C
- DIN Rail Mounting

3. MECHANICAL INTEGRATION

3.1. PACKAGE CONTENTS

- 3.1.1. TBox20;
- 3.1.2. Serial cable PORT1 (one connector – female COM port, another – RJ45);
- 3.1.3. GSM antenna (MMCX connector);
- 3.1.4. The CD with Software and User's Manual.

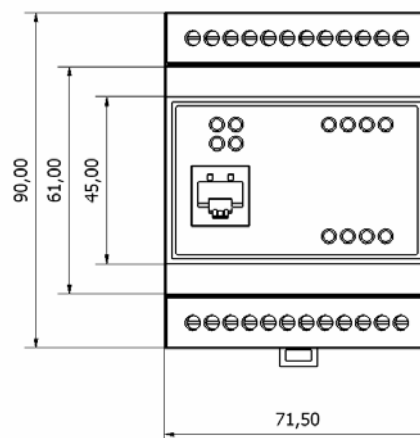
3.2. DIMENSIONS

The plastic case of TBox20 is light and suitable for fitting with electronic instruments that can hook to the DIN EN 50022.

When a place for TBox20 is being planned, it should be considered that GSM antenna, which is supplied in your package, should NOT be placed in metal case. The supplied antenna usually has 2,5 meters length cable, so if you plan to mount TBox20 into a metal case, please mount the antenna outside the metal case. If cable length of 2,5 meters is not enough, contact our sales department to order antennas with longer cables.

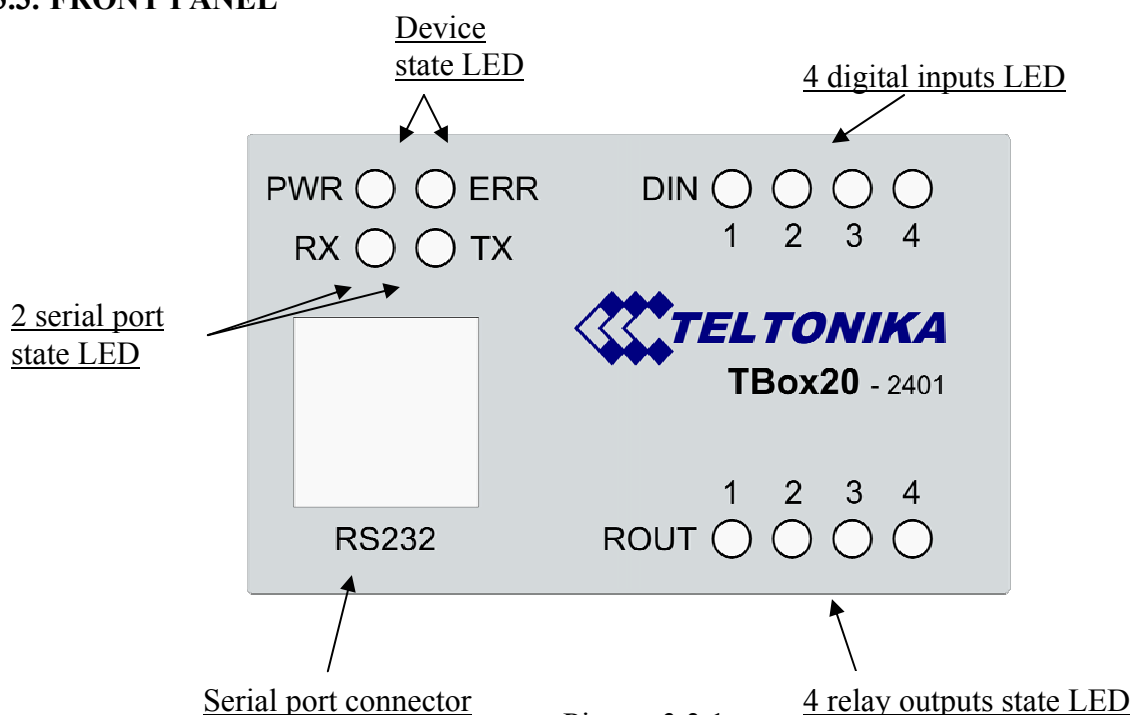


Picture 3.2.1



Picture 3.2.2

3.3. FRONT PANEL



Picture 3.3.1

PWR – Power LED turns on when power is applied to Tbox20. It also shows the device's working status:

- LED ON;
- LED blink low (0.2s ON, 0.6s OFF) – the device is registered in GSM network;
- LED blink high (0.4s ON, 0.4s OFF) – the device transmits via GSM network.

ERR – Error LED turns on when the device has faulty working conditions.

RX – Indicate the receiving data to the device via serial port.

TX – Indicate the sending data from the device via serial port.

DIN – Indicate the digital input's voltage "true" level.

ROUT – Indicate the relay output status.

RS232 – Standard serial communication port.

4. CONNECTORS PIN_OUT

4.1. CONNECTORS FRONT UP PIN-OUT

-	+	-	+	1	2	3	4	⊥	+24V	0V	PE
AIN1		AIN2		DIN				PWR			

Picture 4.1.1

Pin name	Description
AIN 1 -	Analog input 1. Input voltage range is from 0 to 10V (max 15V) or input current range is 0-20mA (max 30mA).
AIN 1 +	
AIN 1 -	Analog input 2. Input voltage range is from 0 to 10V (max 15V) or input current range is 0-20mA (max 30mA).
AIN 1 +	
DIN 1	Digital input 1. This input is optically isolated by two different voltage levels: 0...1V – false; 2...24V – true.
DIN 2	Digital input 2. This input is optically isolated by two different voltage levels: 0...1V – false; 2...24V – true.
DIN 3	Digital input 3. This input is optically isolated by two different voltage levels: 0...1V – false; 2...24V – true.
DIN 4	Digital input 4. This input is optically isolated by two different voltage levels: 0...1V – false; 2...24V – true.
⊥	Digital input ground. It is separated from module ground (power supply, analog input) because digital inputs are optically isolated.
+24V	Device power. Voltage is 24V ±10% DC. Power consumption:
0V	Stand by mode ~50mA@24V, peak up to 300mA@24V. As switched power regulator is used inside, the smaller the voltage, the bigger the current and vice versa (power consumption remains about the same)
PE	Protection earth.

Table 4.1.1. Connector pin-out

4.2. CONNECTORS FRONT DOWN PIN-OUT

ROUT1			ROUT2			ROUT3			ROUT4		
NO	CO	NC	NO	CO	NC	NO	CO	NC	NO	CO	NC

Picture 4.2.1

ROUT 1 NO	Relay 1 normally open output.	Max load ~250V, 7A.
ROUT 1 CO	Relay 1 common output.	
ROUT 1 NC	Relay 1 normally closed output.	
ROUT 2 NO	Relay 2 normally open output.	Max load ~250V, 7A.
ROUT 2 CO	Relay 2 common output.	
ROUT 2 NC	Relay 2 normally closed output.	

ROUT 3 NO	Relay 3 normally open output.	Max load ~250V, 7A.
ROUT 3 CO	Relay 3 common output.	
ROUT 3 NC	Relay 3 normally closed output.	
ROUT 4 NO	Relay 4 normally open output.	Max load ~250V, 7A.
ROUT 4 CO	Relay 4 common output.	
ROUT 4 NC	Relay 4 normally closed output.	

Table 4.2.1. Connector pin-out

4.3. SERIAL PORT (RS232 INTERFACE)

Serial port is used for communication with internal WEB server. Internal WEB server allows to edit configured data.

Serial port parameters:

- Interface format RS232C
- Logic levels (RS232C levels)
- Speed: 115200 bauds
- Format: 8 bits
- Parity: none
- Stop bits: 1
- Flow control: hardware



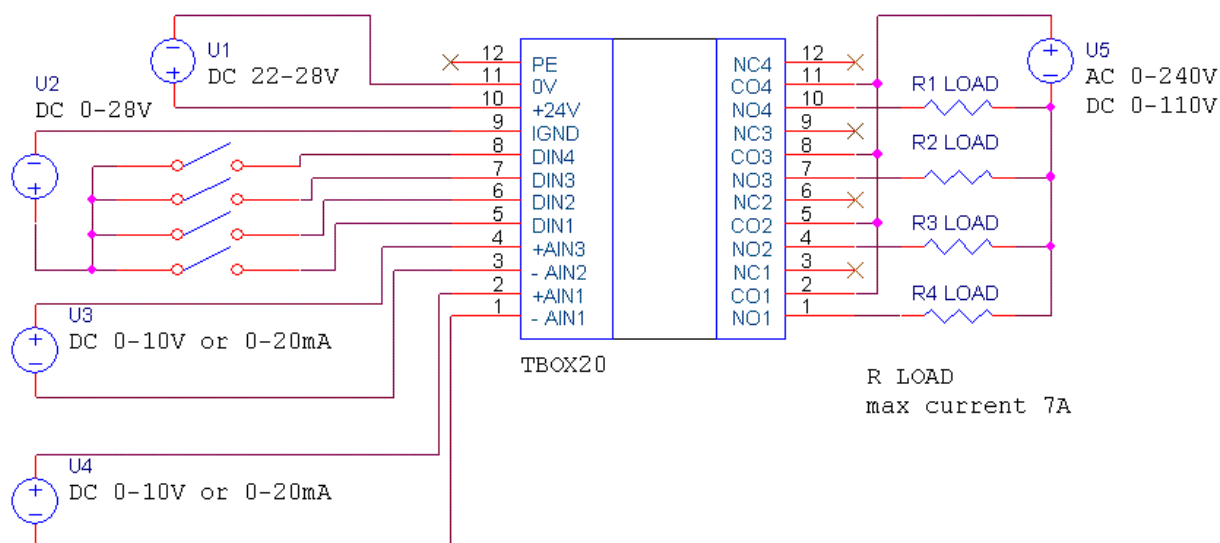
Picture 4.3.1. RJ45 connector

The communication connector is an eight way RJ45 PLUG style connector.

RJ45 Pin number	Description	Direction
1	DSR	Output
2	DCD	Output
3	DTR	Input
4	GND	-
5	RXD	Input
6	TXD	Output
7	CTS	Output
8	RTS	Input

Table 4.3.1. RS232 Connector pin-out

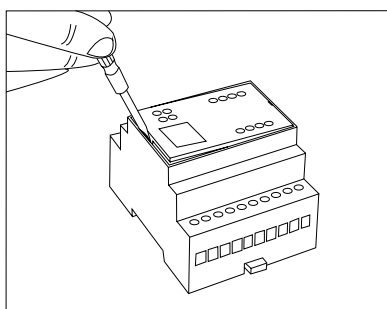
4.4. SAMPLE ELECTRICAL CONNECTION



Picture 4.4.1. Sample scheme

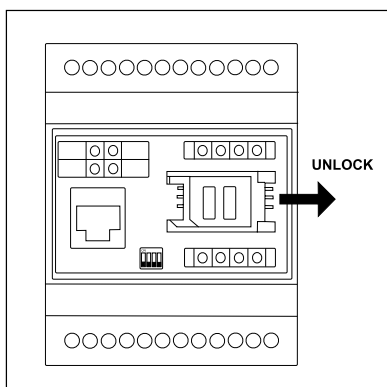
5. INSTALATION AND STARTING

5.1. INSTALLING A SIM CARD

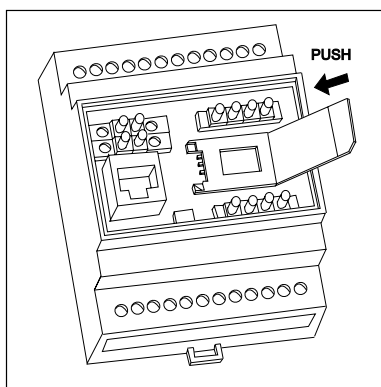


Picture 5.1.1

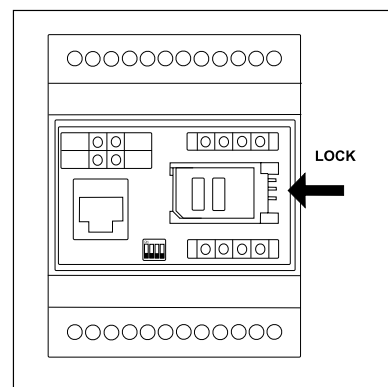
- Remove the cover with screwdriver (see the picture 5.1.1).
- Slide the SIM card holder toward its hinge to unlock it (see the picture 5.1.2).
- Lift the SIM card holder.
- Remove your SIM card from the package (your SIM card might be inserted already.)
- Insert the SIM card into the holder so that the notches align (see the picture 5.1.3).
- Close the SIM card holder.
- Slide the SIM card holder away from its hinges to lock it (see the picture 5.1.4).



Picture 5.1.2



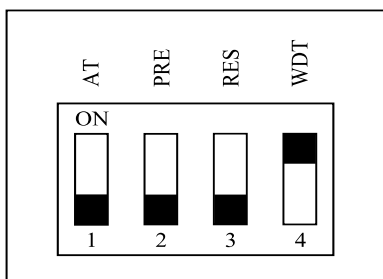
Picture 5.1.3



Picture 5.1.4

5.2. DIP SWITCH SETTINGS

Dip switch should be set according the picture 5.2.1 for the normal working conditions.



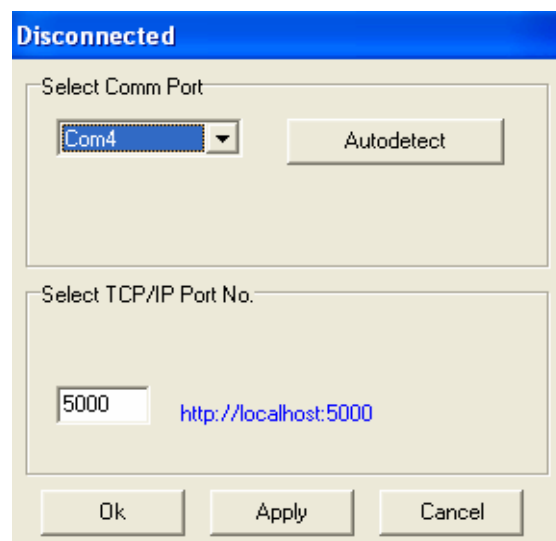
Picture 5.2.1

Switch number	OFF	ON
1	Serial port works in the normal mode	Serial port works in the "AT Command" mode
2	Normal working conditions	Preset factory parameters
3	Normal working conditions	Reset GSM module
4	"Watchdog" off	"Watchdog" on

Table 5.2.1

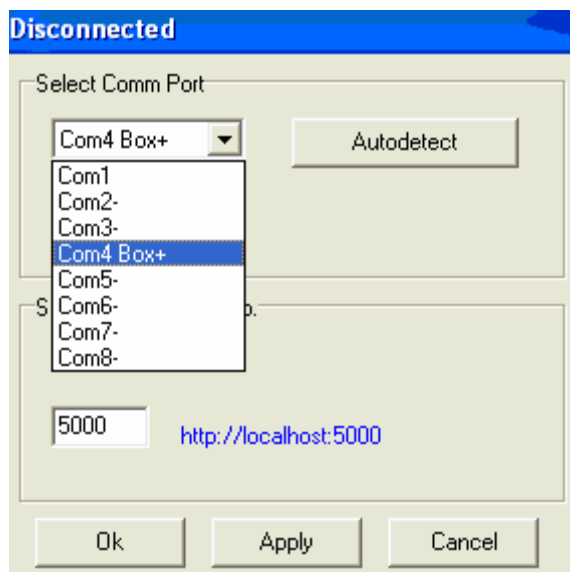
5.3. CONNECTION TO PC

- 5.3.1. Install Tbox20 for windows. To perform the installation, run the following programs from your CD or download folder Tbox20.exe.
- 5.3.2. Connect PC serial port to the Tbox20 serial port cable PORT1.
- 5.3.3. After installation you can run the program by clicking SERVER in Start/Programs/Teltonika/Tbox20 directory. To open the program, click the icon on the taskbar.
- 5.3.4. Select serial port number to which Tbox20 is connected.
- 5.3.5. Write to TCP/IP Port number "5000".
- 5.3.6. Click the link <http://localhost:5000> and



- Internet explorer window will run automatically. There you will see Tbox20 application.
- 5.3.7. You can find possible port to which is connected TBox20 device by pressing the button *Autodetect*. After you need to select detected COM port with record Box. Sign - (Com2-) – port 2 not exist. Sign + (Com4 Box+) port 4 exists, connected to TBox20 and currently it is active (+). Record COM1 without sign and "Box" – port

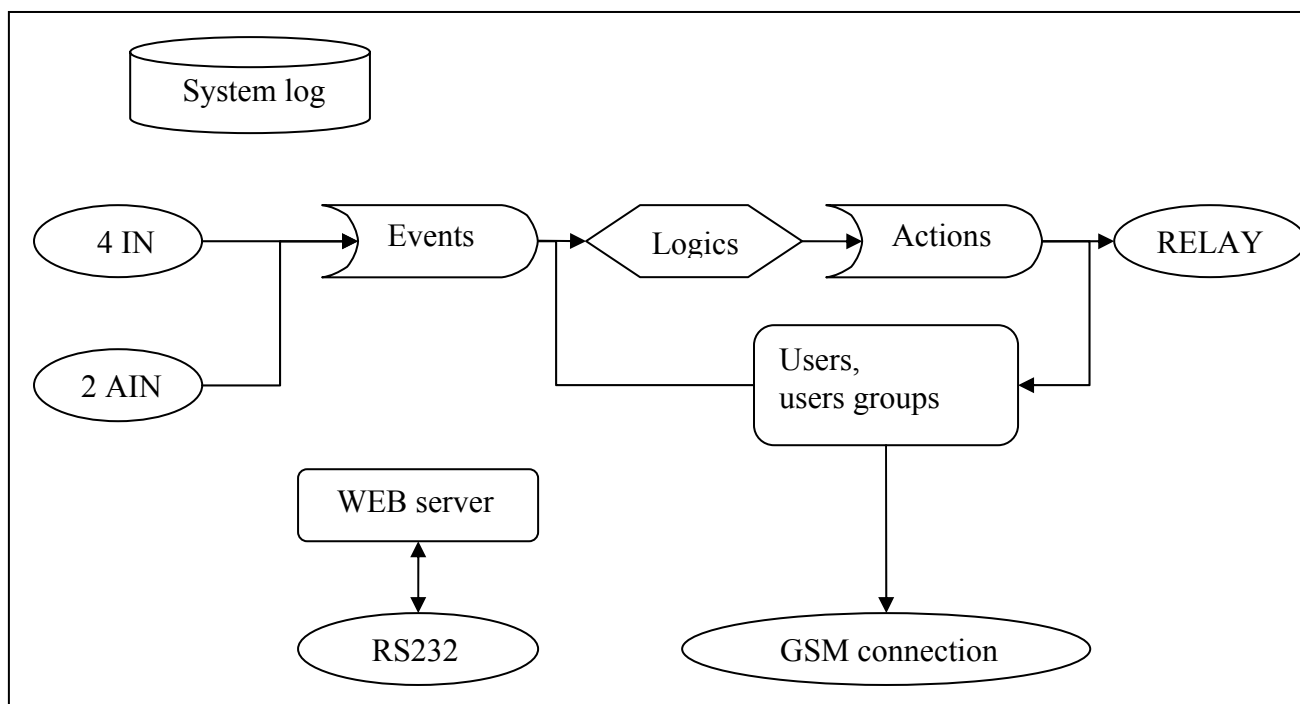
exists. If “.” with COM port number, then the port is busy. Maybe it is opened by another program.



6. DATA CONFIGURATION

Data configuration is executed by the internal WEB server application. You need to connect Tbox20 to PC and the server program should be run (see section 5.3).

6.1. APPLICATION'S LOGICAL ELEMENT



Picture 6.1.1

6.2. FUNCTIONS

TBox20 is a monitoring and control device for remote objects. Remote commands are described by three definitions: logic (the relationship between elements), event (an occurrence detected by the device) and action (a state or process that is controlled by the device). Events are following occurrences: four digital inputs, two analog inputs, two types of receiving messages (SMS, call). Actions are those possible processes: relay state controlling (on, off, toggle) and sending message (SMS, email, call).

User is authorized person which is allowed to use the device via messages. Users can be jointed into the group.

The device is configurable through internal WEB server interface via GSM network and RS232 interface.

System log is the register of the device's status important occurrences.

6.3. LOGICS

Logics link functional elements (N events and M actions) by means of logical function. M actions are executed when either all or one of N events are presented. The execution of function is completed even if the power was lost.

You can see the logics list by pressing the button *logics*.

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

List of LOGICs

Name

☐ [Fire alarm](#)

DELETE	NEW
--------	-----

Picture 6.3.1

Click the logic name if you want to edit logic.

[Logic](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

Edit LOGIC – Fire alarm

NAME

Fire alarm |

FUNCTION

AND ▼ |

EVENTS

Fire sensor
Temperature > 80 C° |

ACTIONS

To turn on the siren
SMS fire
CALL fire

APPLY	SUBMIT	RESET
-------	--------	-------

Picture 6.3.2

Parameter	Description	Values
Logic name	It's the name of logic and does not have any effect on operation of logic. It's just for easy identification in case you have more than one logic.	Text, numbers, special characters.
Function	Select the type: OR - an action that is produced when one or more events are present, AND - a logical operation that only evaluates as true if all of the events being compared also evaluate as true.	AND, OR
Events	Choose event name. If you want to choose several events, click items together with key "ctrl".	
Actions	Choose action name. If you want to choose several actions, click items together with key "ctrl".	

Picture 6.3.3

6.4. EVENTS

One of the main function elements of Tbox20 is to alert you whenever digital/analog inputs to the Tbox20 cross their predefined value. Events define conditions of the digital inputs (DIN), analog inputs (AIN), received messages and errors.

Press *events* button and list of events will appear.

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

List of EVENTS

Name	Type	State
☐ Fire sensor	Digital UP	
☐ Temperature > 80 C°	Analog UP	

DELETE	NEW analog event	NEW digital event	NEW message event
--------	------------------	-------------------	-------------------

Picture 6.4.1

If you want to add analog (or digital) event, click on *New analog event* (or *New digital event*). Then you will see the new item "no name". Click it and configure parameters. The name of event does not have any role in execution of the event. It's just used as identification, so you are free to give any name.

If you want to delete any event, mark event's checkbox and press *delete*.

Digital input DIN

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

Edit EVENT – Fire sensor

NAME

Fire sensor |

TYPE

Digital UP ▼ |

DIN

1 ▼ |

SETUP TIME (ticks)

3 |

APPLY	SUBMIT	RESET
-------	--------	-------

Picture 6.4.2

When you are setting up events for digital inputs, you would need to configure the following parameters:

Parameter	Description	Values
Event name	It's the name of event and does not have any effect on operation of event. It's just for easy identification in case you have more than one event.	Text, numbers, special characters.
Type	Select the digital type.	Digital UP Digital DOWN
DIN	Choose digital input number.	1- 4
Setup time (ticks)	The time interval after which the event will be sent to the logic function if the event conditions still exist. (Noise cancellation)	1-1000ms

Picture 6.4.3

Analog input AIN

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

Edit EVENT – Temperature > 80 C°

NAME

Temperature > 80 C° |

TYPE

Analog UP ▼ |

AIN

1 ▼ |

SETUP TIME (ticks)

0 |

THRESHOLD (V)

2,098

APPLY	SUBMIT	RESET
-------	--------	-------

Picture 6.4.4

When you are setting up events for analog inputs, you would need to configure the following parameters:

Parameter	Description	Values
Event name	It's the name of event and does not have any effect on operation of event. It's just for easy identification in case you have more than one event.	Text, numbers, special characters.
Type	Select the analog type.	Analog UP Analog DOWN
AIN	Choose analog input number.	1 - 2
Setup time (ticks)	The time interval after which the event will be sent to the logic function if the event conditions still exist. (Noise cancellation)	1-1000ms
Threshold (V)	Select the level of the trigger.	0 – 10 V or 0 – 20mA

Picture 6.4.5

Received messages

When you are setting up the message, you would need to configure the following parameters:

Parameter	Description	Values
Message type	Choose the message type.	SMS, CALL
Recipient	Choose the user or group of users who would receive the event.	Choice from the pull down menu: users and groups – you setup before.
Message text	Text message is the event identification.	Text.

Picture 6.4.6

6.5. ACTIONS

Actions define operations for the device to perform. Press *actions* button to see the list of possible actions.

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)
List of ACTIONSs

Name	Type
☐ To turn on the siren	ROUT ON
☐ SMS fire	Short message
☐ CALL fire	Phone call
DELETE NEW ROUT action NEW message	

Picture 6.5.1

If you want to add action, click on *New ROUT action* (or *New message*) button. Then you will see the new item “no name”. Click it and configure parameters. The name of action does not have any role in execution of the action. It's just used as identification, so you are free to give any independent name.

If you want to delete any action, mark action's checkbox and press *delete*.

ROUT
[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)
[Tests](#)
Edit ACTION – To turn on the siren
NAME

To turn on the siren |

TYPE

ON ▼ |

ROUT

2 ▼ |

HOLD TIME (ticks)

0 |

APPLY	SUBMIT	RESET
-------	--------	-------

Picture 6.5.2

When you are setting up the action, you would need to configure the following parameters:

Parameter	Description	Values
Action name	It's the name of action and does not have any effect on operation of action. It's just for easy identification in case you have more than one action.	Text, numbers, special characters.
Type	You can select the desired type of the output when the action would be	ON, OFF, TOGGLE

ROUT	performed.	
Hold time (ticks)	Choose relay number.	1- 4
	This is the time for which the desired output should be held high/low.	Max value 2147483648
	If "0" is entered, it would mean a permanent change in status of corresponding output.	
	Picture 6.5.3	

Sending messages

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

Edit ACTION – SMS fire

NAME

SMS fire |

TYPE

SMS |

USER / GROUP

Rolandas |

MESSAGE

fire |

APPLY	SUBMIT	RESET
-------	--------	-------

Picture 6.5.4

When you are setting up the message, you would need to configure the following parameters:

Parameter	Description	Values
Message type	Choose the message type to sent the alarm.	SMS, CALL, E-MAIL
Recipient	Choose the users or groups of users who would receive the alarm.	Choice from the pull down menu: users and groups – you setup before.
Message text	The text message will be sent to the authorized users.	Text and numbers.

Picture 6.5.5

6.6. USERS

User is authorized person which is allowed to use the device TBox20. The users entered here would have the privileges to receive alarm alerts or control the actions of TBox20 through SMS or Phone calls. User element is made of user name, telephone number and email address. The user list can be edited by adding or deleting users. Press the *New Person* button to add new user, then enter user name, telephone number and email address. When you want to delete any user, select the respective user/users and press *Delete* button.

User group is a list of users or groups with assigned name. If you have multiple users and you want to manage/classify them, you have the possibility of creating groups. Only the users defined in "Users" menu can be added in the groups. To start creating groups, click the *New Group*.

[Logics](#)
[Events](#)
[Actions](#)
[Users](#)
[Settings](#)
[Status](#)
[System Log](#)

[Tests](#)

List of USERS

Name	Type
☐ Rolandas	PERSON

DELETE	NEW Person	NEW Group
--------	------------	-----------

Picture 6.6.1

Note: Whenever a user is deleted, he will be removed from corresponding groups to which he belonged. However if the groups belonged only to a single user, deletion of this user would also result in deletion of corresponding groups.

6.7. SETTINGS

6.7.1. ADC CALIBRATION

[Logics](#)
[Events](#)
[Actions](#)
[Users](#)
[Settings](#)
[Status](#)
[System Log](#)

[Tests](#)

Settings

ANALOG INPUTS

	Mode	Value	Calibrate
Analog input 1	VOLTAGE ▼	(482) 1.927 V	APPLY SUBMIT RESET
Analog input 2	VOLTAGE ▼	(505) 2.019 V	APPLY SUBMIT RESET

Picture 6.7.1

6.7.2. EMAIL

You need to fill in this information to send email. SMTP server address is given by GSM network provider. Enter the Tbox20 email name to identify the e-mail's sender in the **Sender Address** field.

[Logics](#)
[Events](#)
[Actions](#)
[Users](#)
[Settings](#)
[Status](#)
[System Log](#)

[Tests](#)

Settings

E-MAIL

SMTP Server:	
Sender address:	

Picture 6.7.2

6.7.3. GPRS

Changing of PIN or PIN forbid is possible in the PIN item. If it is necessary to protect SIM card in the TBox20 by PIN number, to area SIM PIN it is written PIN number and it is confirmed by button Store PIN. The TBox20 then by help written PIN unlocked access to SIM card after stand by TBox20. The PIN number is possible forbid by button Unlock SIM card.

In the window it is possible to define *APN*, *Username*, *Password* and *IP address*. If the *APN* field is not filled in, the APN will be automatically assigned by the IMSI code of the SIM card. If the PLMN is not in book of APN, then will be use default APN "internet". APN is added of the mobile operator. If the *IP address* field is not filled in, the IP address will be automatically assigned by the operator when establishing the connection.

The changes in settings will apply after pressing the *Apply* button.

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

Settings

GSM/ GPRS

Pin code:	
Access point:	
Apply changes	

Picture 6.7.3

6.8. TEST

Test describes the device status review.

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

TESTS

Tbox20 test	
☐ DIN 1	ROUT 1 ☒
☐ DIN 2	ROUT 2 ☒
☐ DIN 3	ROUT 3 ☒
☐ DIN 4	ROUT 4 ☒
1.932V (a=483mV, k0-0,k*-2500)	AIN 1 ☐ current mode
2.028V (a=507mV, k0-0,k*-2500)	AIN 2 ☐ current mode
Apply	

Safety controller

err = 0x104	ADC0 mcu
err = 0x106	ADC1 pwr
☐ Dip switch „AT“	
☐ Dip switch „Preset“	

- ☐ Dip switch „wdt“
- ☐ Warning U pwr < 10V
- ☐ Warning U pwr < 21.6V
- ☐ Warning U mcu < 3.3V
- ☐ Warning U mcu > 4.2V
- ☐ Device fault

Refresh

Picture 6.8.1

6.9. STATUS

The item *GPRS* in menu contains information about PLMN (code of operator), cell, channel and signal (information are by a single application find out on power up TBox20). In bottom of window hereof windows it is GPRS Connection Log, where there are information about make up GPRS connection and pertinent problems on this formation.

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

Status

Connection

Not establish.

SMS_ERR_SIM_CARD

Picture 6.9.1

6.10. LOG

LOG is the events registration. There are max 10 events in one page. There's also the list of errors.

[Logics](#) [Events](#) [Actions](#) [Users](#) [Settings](#) [Status](#) [System Log](#)

[Tests](#)

System LOG

```
2004.01.01 00:00:06 DEVICE STARTED
2004.01.01 00:00:11 DEVICE STARTED
2004.01.01 00:00:11 Failed to read EVENT from configuration
2004.01.01 00:00:14 SMS_ERR_SIM_CARD
2004.01.01 01:21:34 DEVICE STARTED
2004.01.01 01:21:34 SMS_ERR_SIM_CARD
2004.01.01 09:56:06 DEVICE STARTED
2004.01.01 09:56:06 SMS_ERR_SIM_CARD
```

DISABLE

ERASE

Picture 6.10.1

7. SUPPORT

Before contacting for support, make sure that you went through the above manual thoroughly. If you are still facing problems, feel free to contact our technical support team at support@teltonika.lt we would be glad to help you.