INTRUSION AND FIRE ALARM

CONTROL UNIT

SIGNAL-10

USER'S MANUAL

CONTENTS

WARNING

To change configuration parameters of the Signal-10 please use

UPROG.EXE software utility of version **4.1.0.48** or higher.

This User's Manual is intended to help for studying operability principles and maintenance of **Signal-10 Intrusion and Fire Alarm Control Unit** of version **1.12**.

Please read the instructions completely before connecting, operating, adjusting or maintaining this product.

The following terms are used throughout the Manual:

Alarm Loop (AL): All the detectors and wires connected to an input of the Signal-10, an initiating device circuit.

Input: An actual input of the Signal-10. The following circuits can be connected to a device's input:

- An alarm loop;
- A fire threshold addressable alarm loop;
- An auxiliary alarm loop;
- A programmable auxiliary alarm loop.

Zone: Two or more inputs of the Signal-10 to which the fire alarm loops detecting appearance of fire factors within some minimally independent monitored area of the protected premises are connected.

Arm/Disarm means starting/cancellation monitoring of loop (partition, system) conditions and signaling alarms in controlled alarm loops.

Integration Time: A time interval during which sudden alterations of loop resistance are not considered as initiating an alarm, thus producing no alarms.

Network Address (or Address): A unique number of a device (from 1 to 127) within the ISS Orion local RS-485 network.

1 General

1.1. Signal-10 Intrusion and Fire Alarm Control Unit (hereinafter referred to as the Signal-10 or the unit) is intended to be used in cooperation with an Orion network controller (an S2000M panel or a personal computer with Orion Pro software installed) as a control and indicating equipment in a modular system of:

- Intrusion and Panic Alarms;
- Fire Alarms and Fire Fighting.

In standalone mode the Signal-10 operates as an intrusion alarm control and indicating unit.

While operating under an S2000M control panel of version 3.00+ the Signal-10 provides connecting various fire-fighting equipment in accordance with S2000M User's Manual.

The unit provides:

- Monitoring and indication of states of ten alarm, fire, and panic alarm loops as well as circuits of auxiliary equipment; indicating the state of each the alarm loop by means of the built-in LEDs;
- Receiving responses of automatic and manual, passive and active (powered via the loop), four-wire fire or intrusion detectors with normally closed or normally open internal contacts;
- Local operating (arming and disarming) of individual intrusion alarm loops or groups of intrusion alarm loops in case of reading codes of iButtons or other credentials with a 1-Wire (µ-LAN) output interface;
- Remote (centralized) operating of individual alarm loops or groups of alarm loops combined in a partition by a command of the network controller (S2000M control panel or a PC with Orion Pro software installed);
- Remote or local control of outputs;
- Sending fire alarms and troubles to a fire brigade;
- Sending alarms to a central monitoring station (CMS);
- Control of sound and light alarms (notification appliances) connected to the SRN and LMP outputs for open circuit failures and short circuit failures;
- Connecting a second power supply to the additional input;
- Sending a code of a credential to the network controller for centralized operating of partitions;
- Indicating a partition status by means of an external two-color indicator (outputs LED R and LED GR).

1.2. The Signal-10 is to be powered by an external dc power supply providing 12 V to 24 V. Bolid manufactured battery backed power supplies of RIP-12 or RIP-24 series are recommended to be used.

1.3. The Signal-10 is to be installed within indoor unheated premises and intended for round-the-clock operation.

1.4. The Signal-10 is not intended to be used in aggressive media or dust conditions, or in ex-hazardous areas. The Ingress Protection Rating is IP20 (in accordance with Russian Standard ГОСТ 14254).

1.5. The Signal-10 is designed to operate in following ambient conditions:

1) Ambient temperature: minus 30 to +50 °C;
2) Relative humidity: up to 98 % at +25 °C;
3) Vibration load: in the range of 1 to 35 Hz at max acceleration 4.9 m/s^2 (0.5 g).

1.6. The mean time before failures in operation mode is 35000 hours.

1.7. The average lifetime of the Signal-10 is 10 years.

1.8. The weight of the Signal-10 doesn't exceed 0.3 kg.

1.9. The overall dimensions are 156 mm × 107 mm × 39 mm.

1.10. The pre-operation time of the Signal-10 after applying power is 3 seconds maximum (if a stable voltage of more than 11 V is applied across the terminals of at least one power input of the Signal-10).

2 Specifications

2.1. The number of the unit's inputs is 10.

2.2. The number of switched circuits is 6.

2.2.1. The number of outputs to send signals to a central monitoring station:

– «ALR1» – 1;
– «ALR2» – 1.

2.2.2. The number of outputs to control light and sound alarms:

– «SRN»: Sound alarms – 1;
– «LMP»: Light alarms – 1.

2.2.3. The number of outputs to control light indicators of an external reader:

– «LED R»: Red indicator – 1;
– «LED G»: Green indicator – 1.

Note: – The reader LEDs are controlled by logic +5V CMOS levels. In case of direct connection the Signal-10 limits the current at the level of 10 mA.

2.3. The number of monitored circuits is 16:

– «1»…«10»: inputs AL1…AL10 – 10;
– «TM»: the credential reader connection circuit – 1;
– «A», «B»: RS-485 interface bus – 1;
– «LMP», «SRN»: the monitored circuits of the outputs – 2;
– «U1», «U2»: the power inputs of the unit – 2.

2.4. The number of the executive outputs is 4:

– «ALR1», «ALR2»: the normally open contacts of the solid state relays.
  The maximum switched voltage is:
  – 170 V/0.1 A (dc);
  – 130 V/0.1 A (ac);
– «LMP», «SRN»: transistor outputs with monitoring of load circuits. The maximum switched voltage is 28 V/1 A.

Note: – Unit power voltage is switched to the outputs LMP and SRN. When the output load is close to the maximum value the Signal-10 should be powered by a 24V dc power supply.

2.5. The transmitted events are the following:

– ARMED;
– ARMING FAILED;
– FIRE SIGNAL;
– FIRE PREALARM;
– FIRE 1 ALARM;
– FIRE 2 ALARM;
– LOOP TRBL OPEN;
– LOOP TRBL SHORT;
– TAMPER ALARM;
– TAMPER RESTORED;
– TESTING;
– PROGRAMMING;
– ARMING DELAY;
– DISARMED;
– DEVICE RESTART;
– POWER FAILURE;
– POWER RESTORED;
– ILLEGAL CODE;
– USER'S CODE ENTERED;
– AUX ZONE RESTORED;

– AUX ZONE ALARM;
– PANIC ALARM;
– ENTRANCE ALARM;
– READY TO ARM;
– NOT READY TO ARM;
– INTRUSION ALARM.

2.6. The Signal-10 transmits the network controller alarm messages over the RS-485 highway interface. The data transmission parameters are:

– 9600 baud;
– Half-duplex.

If a PC operates as a network controller then data are communicated via one of Bolid manufactured interface converters (USB-RS485, S2000-PI, or S2000-USB).

2.6.1. If a communication loss has occurred during generating a message, the event will be stored in the Signal-10 nonvolatile memory. When communication is restored, the event will be transmitted to the network controller with the time and data specified by the internal Signal-10 clock.

The Signal-10 nonvolatile memory is capable of storing up to 512 last events.

2.7. When the power voltage drops to 9.5(±0.2) V the Signal-10 switches to Power Failure mode. When power voltage is restored and exceeds 10.2(±0.2) V the Signal-10 returns to Operation mode. If the power voltage has dropped below 9(±0.2) V the Signal-10 shuts off.

2.8. Table 2.1 shows the standard values of current consumed by the Signal-10 in main operation modes in case of standard operating.

Table 2.1. Typical Values of Consumed Current

Conditions	Mode	Power Voltage	
		12 V	*24 V*
All the alarm loops connected to the Signal-10 are armed and there are no detectors powered via the alarm loops	OK	220 mA	110 mA
	Alarm	230 mA	115 mA
All the alarm loops connected to the Signal-10 are armed; all the detectors are powered via the alarm loops and the total current consumption in each alarm loop is 3 mA (totally, I = 30 mA)	OK	310 mA	150 mA
	Fire Alarm (two detectors have responded)	410 mA	200 mA

If the inputs of the device are loaded partially (that is, some detectors are powered via the loop but their totally consumed current doesn't exceed the maximum value) then the current consumed by the Signal-10 can be considered as increasing in direct proportion to the current consumed by the detectors.

So, if all termination resistors are installed, the current consumed by the Signal-10 can be calculated by formulas:

1. If the Signal-10 is powered by a **12 V** power supply:

$$\mathbf{I = 2.75 \cdot i + 220\ [mA]}$$

2. If the Signal-10 is powered by a **24 V** power supply:

$$\mathbf{I = 1.23 \cdot i + 110\ [mA]}, \text{ where:}$$

I stands for the total current consumed by the device (without regard to connected alarms) [mA],
i stands for the current consumed by active detectors in the alarm loops of the Signal-10 [mA].

The total time of battery-backed operation, taking into account the margin 25%, is estimated by formula:

$$\mathbf{T = 750 \cdot W / I\ [h]}, \text{ where:}$$

W stands for the capacity of a backup battery [Ah],
I stands for the current consumed by the Signal-10 [mA].

2.9. The Signal-10 provides steady voltage at alarm loop inputs:

- In the Operation mode from 19 V to 22 V, the resistance 4.7 K ±5 % being wired into the loop and the detectors consuming 0 mA to 3 mA;
- In case of an open circuit failure at the input 27 ±0.5 V.

2.10. In case of a short circuit in an alarm loop the Signal-10 provides steady voltage at other inputs as said in Section 2.9. Simultaneously no more than three alarm loops can be in short circuit condition.

2.11. The Signal-10 provides limiting of the current for an alarm loop in short circuit condition at the level of 26.5 mA maximum.

2.12. The maximum loop ripple voltage is 20 mV.

2.13. If intrusion detectors are connected to a unit's input (intrusion alarm loop) the Signal-10 is in the Operation mode with the following alarm loop parameters:

- The resistance of wires without regard to the termination resistor doesn't exceed 1 K;
- The minimum leakage resistance between the loop wires or between each wire and earth is 20 K.

If fire detectors are connected to a unit's input (fire alarm loop) the Signal-10 is in the Operation mode with the following alarm loop parameters:

- The wire resistance without regard to termination resistor doesn't exceed 100 Ω;
- The minimum leakage resistance between loop wires or between each wire and earth is 50 K.

The Signal-10 provides reading of electronic credentials which operate with Dallas Touch Memory (iButton) interface and the following parameters of the line:

- The distance from the unit to the iButton reader doesn't exceed 100 m;
- The capacity of the circuit doesn't exceed 6 nF.

The maximum distance between the unit and Proximity card readers operating with the interface Dallas Touch Memory (iButton) depends on the reader type.

When current-consumed readers are in use then apart from the capacity of the line the resistance of the circuit connecting GND contact (the negative power circuit of the reader) with 0 V contact of the Signal-10 is of great importance. So, if the reader is too far from the unit (50 m and more) and (or) consumes a high current (more than 50 mA) it is recommended to:

- Use a cable with wires with larger cross section for connection of the reader;
- Use vacant wires of the cable to double the GND circuit;
- Power the reader from an independent power supply.

2.14. The Signal-10 is resistant against such electromagnetic disturbances in its alarm loops as 50 Hz sine waves of up to 1 V effective voltage and single voltage pulses with height of up to 300 V and pulse width of up to 10 ms.

2.15. The Signal-10 provides limiting of control current for notification appliance circuits connected to the SRN and LMP outputs at the level of 3 mA max when being off.

2.16. The Signal-10 provides current protection for notification appliance circuits connected to the SRN and LMP outputs by means of resettable fuses.

3 Standard Delivery

Find the following when unpacking the Signal-10:

1) Signal-10 – 1 pc.;
2) Instruction Manual – 1 pc.;
3) 4.7 kOhm Termination Resistors – 10 pcs.;
4) Woodscrews – 3 pcs.;
5) Wall Plugs – 3 pcs.;
6) DIN 7982 Flat Head Tapping Screw with Cross Drive 2.2×6.5 – 1 pc.

Note: – Readers such as Schityvatel-3 or similar and DS1990A iButtons are not supplied with the Signal-10 and should be ordered separately.

4 Description

The view of the Signal-10 along with its overall and mounting dimensions are represented in a picture in Appendix A.

The enclosure consists of a base and a cover.

There are indicators of the alarm loops «1» … «10» and a READY indicator on the unit's cover.

A PC board is attached to the base. The elements on the PC board are: LED indicators, terminal blocks for external connections, a built-in sounder and a tamper switch.

The Signal-10 consists of the following main components:

- 27 V voltage converter;
- 5 V voltage converter;
- Processor;
- Light indicators;
- ALR1 and ALR 2 solid state relays;
- Electronic switches LMP and SRN;
- RS-485 interface converter;
- Non-volatile memory;
- Tamper switch;
- Credential reader input;
- Built-in sounder.

The processor controls operation of the Signal-10:

- Cyclically polls the alarm loops and monitors their states by measuring their resistance values;
- Controls the internal light indicators, the sounder, the outputs, resetting power of the alarm loops;
- Receives commands and transmits messages over the RS-485 interface bus.

Voltage from the measuring circuits arrives at the input of a built-in ATD converter. Based on the measured value of the effective resistance of an alarm loop the current status of the alarm loop is recognized which can be OK, a trouble, an alarm, etc.

The non-volatile memory is used as an event buffer for storing events along with the date and time of their origin.

4.1. Inputs

Up to ten alarm loops can be connected to the Signal-10 inputs. Depending on the status of a connected alarm loop, the Signal-10 can perform the following:

- Indicates alarm loop states by means of the built-in two-color LEDs «1» – «10» on its cover;
- Activates the internal sounder in case of various alarms;
- Controls the Signal-10 outputs.

A status of an alarm loop is defined by its type, its resistance and its logic state (whether it is armed or disarmed/disabled).

4.1.1. Fire and intrusion detectors of any type intended to be powered by a DC supply can be brought into the alarm loops of the Signal-10 if the internal resistance of the detectors in Fire mode is:

- No more than 2.7 K for normally open detectors; and
- No less than 3.2 K for normally closed detectors.

4.1.2. Configuration parameters of the alarm loops.

Table 4.1 shows a set of parameters which can be programmed for the Signal-10 to define a monitoring algorithm for each the alarm loop.

Table 4.1. Configuration Parameters of the Alarm Loops

Parameter	Description	Range
Input Type	Defines the tactics the alarm loop to be monitored with, the kind of detectors to be included into the alarm loop, and states to be assigned to the alarm loop	1 – Smoke Two Threshold
		2 – Fire Combined (Smoke + Heat) Single Threshold
		3 – Heat Two Threshold
		4 – Intrusion
		5 – Intrusion With Tamper Monitoring*
		6 – Auxiliary
		7 – Entrance
		11 – Panic
		12 – Programmable Auxiliary
		14 – Fire Threshold Addressable
		16 – Fire Manual
Zone Number	The number of the zone the input belongs to. An input can belong only to a single zone	0…5 (0 means that the input is associated with no zone)
Alarm Delay	The delay for switching from Entrance Alarm status to Intrusion Alarm status (the parameter is actual only for intrusion alarm loops)	0 to 255 s
Arming Delay	The delay between receiving an arming command and switching the loop to the Armed mode	0 to 255 s
Auto Rearming After Failing	Automatic switching from the Arming Failed status to the Armed status upon alarm loop's restoring	On / Off
Input Analysis Delay	The time interval required for transient processes to be completed within the alarm loop after power resets. During this time the status of the alarm loop is not analyzed	From 1 s to 63 s

Table 4.1 *(Continued)*

Parameter	Description	Range
Relay 1 Activation Delay	The delay in seconds between having the related alarm loop (loops) activated and activating the relay	0 to 255 s
Relay 2 Activation Delay		
Relay 3 Activation Delay		
Relay 4 Activation Delay		
Never Disarm	The alarm loop can be disarmed by no way	On / Off
Auto Rearming After Alarm	Automatic switching from the Intrusion Alarm or Panic Alarm status to the Armed status when the alarm loop has been restored (Relevant only for intrusion alarm loops)	On / Off
Disarmed Input Monitoring	The directive to transmit over the RS-485 interface messages about changes of conditions (Norm/No Norm) of the disarmed loop	On / Off
Fire Input Requery Prohibition	Being on, disables the function of repeated query for the loop condition for alarm loops of Types 1 and 2	On / Off
300-ms Integration Time	Being on, causes an intrusion alarm loop to enter the Intrusion Alarm status if this one has been activated for more than 300 ms	On / Off
10% Deviation Blocking	Being on, causes an intrusion alarm loop not to enter the Intrusion Alarm status if its resistance value has been changed more than by 10% within 255 s	On / Off
Relay 1 (ALR1) Control	Relates relay control with this alarm loop	On / Off
Relay 2 (ALR2) Control		On / Off
Relay 3 (SRN) Control		On / Off
Relay 4 (LMP) Control		On / Off
Connected Addressable Detectors	Relates alarm loops of the Type 14 with the addresses of threshold addressable detectors and call points preliminary brought to the alarm loops (see Clause 4.1.5)	On / Off

* see Note on page 14.

The main configuration parameter of each the Signal-10 alarm loop is the **Input Type**. This parameter defines how the alarm loop will be monitored and which detectors can be included into this loop. The Signal-10 supports 11 various types of inputs (types of alarm loops).

Type 1: Smoke Two-Threshold Alarm Loop

A loop of the Type 1 (Smoke Two-Threshold) is intended to involve fire smoke (normally open) detectors. This loop is considered to be in one of the following states:

- Armed: The alarm loop is monitored, its resistance being normal;
- Disarmed (Disconnected): The alarm loop is not monitored;
- Arming Delay: The Arming Delay has not yet expired;

- Fire Prealarm: A single detector has actuated within the alarm loop (If **Fire Input Requery Prohibition** is set on);
- Fire 1 Alarm: The alarm loop enters this state if:
  - Response of a single detector has been confirmed (after a repeated query);
  - Two detectors have responded (**Fire Input Requery Prohibition** is set on) in a single alarm loop within 120 s;
  - Two various alarm loops from a single zone have entered the Fire Pre-alarm status within 120 s, the alarm loop which entered the Fire Alarm status by first having not changed its status;
- Fire 2 Alarm: The alarm loop enters this state if:
  - Response of two detectors within a single alarm loop has been confirmed (after a repeated query) within 120 s;
  - A second Fire 1 Alarm condition has been detected for different alarm loops included into a single zone within 120 s. In this case the alarm loop which entered the Fire 1 Alarm status by first doesn't change its status;
- Short Circuit Failure: The resistance of the alarm loop is less than 100 Ω;
- Open Circuit Failure: The resistance of the alarm loop is more than 6 K;
- Arming Failed: The alarm loop has been activated at the moment of being armed.

When **Fire Input Requery Prohibition** is set off:

When a detector has responded, the Signal-10 generates a Fire Signal message and repeatedly queries the condition of the alarm loop by resetting (shutting off for a short time) its power for 3 s. After a delay equal to the value of **Input Analysis Delay** the Signal-10 begins to consider the status of the alarm loop. If within 55 s after resetting the alarm loop responds repeatedly, the alarm loop is switched to the Fire 1 Alarm status. If, otherwise, the detector has not responded repeatedly within 55 s, the alarm loop returns to the Armed status. The alarm loop can switch from the Fire 1 Alarm status to the Fire 2 Alarm status as described above.

When **Fire Input Requery Prohibition** is set on:

When a detector has responded, the Signal-10 generates a Fire Signal message and immediately switches the alarm loop to Fire Prealarm status. The alarm loop can switch to the Fire 1 Alarm status in cases described above.

The integration time for an alarm loop of the Type 1 is defined in accordance with the requirements mentioned in Section 4.1.3.

Table 4.2 shows the matching between current resistance values and corresponding statuses of alarm loops of the Type 1.

The wiring diagram for including fire smoke (normally open) detectors into alarm loops of the Type 1 is presented in Appendix D.

Type 2: Combined Fire Single-Threshold Alarm Loop

A loop of the Type 2 (Combined Fire Single-Threshold) is intended to involve fire smoke (normally open) and heat (normally closed) detectors. This loop is considered to be in one of the following states:

- Armed: The alarm loop is monitored, its resistance being normal;
- Disarmed (Disconnected): The alarm loop is not monitored;
- Arming Delay: The programmed Arming Delay has not been expired;
- Fire Prealarm: The alarm loop enters this state if:
  - A single smoke detector has actuated within the alarm loop (If Fire Input Requery Prohibition is set on), or
  - A heat detector has responded with an alarm;
- Fire 1 Alarm: The alarm loop enters this state if:

- A response of a smoke detector has been confirmed (after a repeated query);
- Two different alarm loops from the same zone have been entered the Fire Alarm status within 120 s and keep this state;

– Fire 2 Alarm: The alarm loop enters this state if:
- Two different alarm loops included into a single zone have entered the Fire 1 Alarm status within 120 s. In this case the alarm loop which entered the Fire 1 Alarm status by first has not changed its status;

– Short Circuit Failure: The resistance of the loop is less than 100 Ω;
– Open Circuit Failure: The resistance of the loop is more than 16 K;
– Arming Failed: An attempt to arm the loop has failed because the loop is activated.

A response of a heat detector causes the Signal-10 to enter Fire Pre-Alarm status.

In case of a response of a smoke detector the Signal-10 generates a Fire Signal message.

If **Fire Input Requery Prohibition** is set off, the Signal-10 repeatedly queries for condition of the alarm loop (see the Type 1). If the smoke detector response is confirmed, the alarm loop switches to Fire 1 Alarm status, otherwise it returns to Armed status. The alarm loop can switch from Fire 1 Alarm status to Fire 2 Alarm status in cases described above.

If **Fire Input Requery Prohibition** is set on, the Signal-10 immediately switches the alarm loop to Fire Prealarm status. The alarm loop can enter from Fire Prealarm condition to the Fire 1 Alarm condition in cases described above.

The integration time for an alarm loop of the Type 2 is defined in accordance with the requirements of Section 4.1.3.

Table 4.2 matches current resistance values and corresponding states of alarm loops of the Type 2.

The wiring diagram for including fire smoke (normally open) and fire heat (normally closed) detectors into alarm loops of the Type 2 is presented in Appendix D.

Type 3: Heat Two-Threshold Alarm Loop

A loop of the Type 3 (Heat Two-Threshold) is intended to involve fire heat (normally closed) detectors. This loop is considered to be in one of the following states:

– Armed: The alarm loop is monitored, its resistance being normal;
– Disarmed (Disconnected): The alarm loop is not monitored;
– Arming Delay: The programmed Arming Delay has not yet expired;
– Fire Prealarm: A single detector has actuated within the alarm loop;
– Fire 1 Alarm: The alarm loop enters this state if:
- Two detectors brought to a single alarm loop have responded within 120 s; or
- Two different alarm loops from a single zone have entered the Fire Prealarm status within120 s and the alarm loop which entered this state by first haven’t changed its state;

– Fire 2 Alarm: The alarm loop enters this state if:
- Two different alarm loops from a single zone have entered the Fire 1 Alarm status within 120 s and the alarm loop which entered this state by first haven’t changed its state;

– Short Circuit Failure: The resistance of the loop is less than 2 K;
– Open Circuit Failure: The resistance of the loop is more than 25 K;
– Arming Failed: An attempt to arm the loop has failed because the loop is activated.

The integration time for an alarm loop of the Type 3 is defined in accordance with the requirements mentioned in Section 4.1.3.

Table 4.2 matches current resistance values and corresponding states of alarm loops of the Type 3.

The wiring diagram for including fire heat (normally closed) detectors into alarm loops of the Type 3 is presented in Appendix D.

Type 4: Intrusion Alarm Loop

A loop of the Type 4 (Intrusion) is intended to involve intrusion detectors of any type, both normally open and normally closed, and powered either over the loop or separately. This loop is considered to be in one of the following states:

- Armed: The alarm loop is monitored, its resistance being normal;
- Disarmed: The alarm loop is not monitored;
- Arming Delay: The programmed Arming Delay has not yet expired;
- Intrusion Alarm: The alarm loop has been activated;
- Arming Failed: An attempt to arm the loop has failed because the loop is activated.

An Intrusion alarm loop is considered to be activated if its resistance goes out of the normal range or jumps by more than 10% (provided that the **10% Deviation Blocking** parameter is set off). Activation of an intrusion loop causes it to enter Intrusion Alarm status.

An alarm integration time for this type of alarm loops can be 70 ms or 300 ms depending on the programmed value of the **300-ms Integration Time** parameter.

Table 4.2 matches current resistance values and corresponding states of alarm loops of the Type 4.

The wiring diagram for including intrusion detectors into alarm loops of the Type 4 is presented in Appendix D.

Type 5: Intrusion Alarm Loop with Tamper Monitoring

A loop of the Type 5 (Intrusion with Tamper Monitoring) is intended to involve a single normally closed intrusion detector and the tamper switch of this detector. This loop is considered to be in one of the following states:

- Armed: The alarm loop is monitored, its resistance being normal;
- Disarmed: The alarm loop is not monitored;
- Arming Delay: The programmed Arming Delay has not yet expired;
- Intrusion Alarm: The alarm loop has been activated;
- Arming Failed: An attempt to arm the loop has failed because the loop is activated;
- Tamper Alarm: The alarm loop being disarmed, the tamper switch has tripped;

When the alarm loop is armed, any skip of the resistance value (by more than 10%), or actuation of the detector (opening of its alarm contact), or tamper switch actuation causes the loop to be considered as being in the Intrusion Alarm status. When the alarm loop is disarmed, tamper switch actuation causes the alarm loop to be considered as being in the Tamper Alarm status.

An alarm integration time for this type of alarm loops can be 70 ms or 300 ms depending on the programmed value of **300-ms Integration Time**.

Table 4.2 matches current resistance values and corresponding states of alarm loops of the Type 5.

The wiring diagram for including an intrusion detector and its tamper switch into an alarm loop of the Type 5 is presented in Appendix D.

Note: – Please take into account the following using an alarm loop of the Type 5.

If such alarm loop is disarmed when the detector brought in the loop has been responded, in addition to receiving the Disarmed message you can receive some additional messages: Tamper Alarm and Tamper Restored, the last message being received after 15 s since restoring the detector. These additional messages are due to specific operation of the device of this version and don't show actual conditions of the detector's tamper switch.

So, you are not recommended to use the Type 5 in cases when alarm loops are to be supposed to be disarmed after a detector's response (after entering into the protected area).

If such alarm loop is disarmed before the detector trips, no additional message is sent.

Type 6: Auxiliary Alarm Loop

Auxiliary alarm loops (loops of the Type 6) are intended to monitor operability and conditions of firefighting equipment as well as sensors and indicators not related directly with fire or intrusion alarms. Devices with dry contact (both normally closed and open) or open collector outputs can be included into such alarm loop.

This loop is considered to be in one of the following states:

- Auxiliary Loop Restored;
- Auxiliary Loop Alarm.

If the resistance of an alarm loop of the Type 6 has been out of the normal range for more than 300 ms, then the alarm loop is considered to be in the Auxiliary Loop Alarm status. When the loop is restored (that is, its resistance has been within normal range for more than Arming Delay seconds), the loop is considered to be in the Auxiliary Restored status.

An auxiliary alarm loop is *always* monitored; it cannot be blocked or disarmed. If the arming command addressed to this loop is received, the Signal-10 responds with a message about its current status.

When a status of an Auxiliary alarm loop has changed the Signal-10 transmits a relevant message to the network controller. The events related to Auxiliary alarm loops are not stored in the Signal-10 non-volatile memory. Thus, if a status of an Auxiliary alarm loop has changed several times during communication loss, after communication's having restored the network controller receives either a single last message or no message if the current status of the loop is just like as the last transmitted status.

If an Auxiliary alarm loop is related to a Signal-10 relay output, then its activation locks switching the relay in accordance with executive programs ##1 – 8 (general-purpose), #11 (ASPT), #2 (Siren), #33 (ASPT-1), #34 (ASPT-A), #35 (ASPT-A1), #50 - #53 (Switch On / Off, Blink for a Time upon Fire 2 Alarm), see Table 4.4. This functionality is suitable, for example, to lock automatic actuation of gas firefighting installations when a door in protected premises is open.

Table 4.2 matches current resistance values and corresponding states of alarm loops of the Type 6.

All normally closed and normally open detectors and other devices with dry contact outputs are included into Auxiliary alarm loops similarly to that how intrusion detectors are included to alarm loops of the Type 4 (See Appendix D).

Type 7: Entrance Alarm Loop

A loop of the Type 7 (Entrance) is intended to involve any intrusion detectors, both normally open and normally closed, and powered either over the loop or separately. This loop is considered to be in one of the following states:

- Armed: The alarm loop is monitored, its resistance being normal;
- Disarmed: The alarm loop is not monitored;
- Arming Delay: The programmed Arming Delay has not yet expired;
- Entrance Alarm: The alarm loop has been activated;
- Intrusion Alarm: Since activation of the alarm loop the time of given **Alarm Delay** has been expired;
- Arming Failed: An attempt to arm the loop has failed because the loop is activated.

An Entrance alarm loop is operated similarly to an Intrusion alarm loop, except for this loop switches to the Entrance Alarm status immediately after its activation. Then, if this alarm loop is not disarmed or armed until the **Alarm Delay** has been expired, the loop switches to the Intrusion Alarm status.

While the alarm loop is being in the Entrance Alarm status, no relay controlled in accordance with one of the general-purposed executive programs (#1 – #8) or Siren program (# 12) is activated.

An alarm integration time for this type of alarm loops can be 70 ms or 300 ms depending on the programmed value of the **300-ms Integration Time** parameter.

Table 4.2 matches current resistance values and corresponding states of alarm loops of the Type 7.

Intrusion detectors are connected into an alarm loop of the Type 7 similarly to connecting of intrusion alarm detectors into the alarm loops of the Type 4 (see Appendix D).

Type 11: Panic Alarm Loop

All kinds of normally closed and normally open panic buttons, pedals and so on can be brought into a Panic alarm loop (Type 11). This loop is considered to be in one of the following states:

- Armed: The alarm loop is monitored, its resistance being normal;
- Disarmed: The alarm loop is not monitored;
- Arming Delay: The programmed Arming Delay has not yet expired;
- Panic Alarm (Attack): An activation of the alarm loop has been detected;
- Arming Failed: An attempt to arm the loop has failed because the loop is activated.

A Panic alarm loop is operated similarly to an Intrusion alarm loop, except for this loop switches to the Panic Alarm status after it is activated.

The Panic Alarm status is indicated only by the relevant Signal-10 LEDs and can initiate only that related relay which is programmed to operate in accordance with Alarm Output 1 (#10) or Alarm Output 2 (#16) executive program (the relay contacts being opened). The internal sounder of the Signal-10 is not activated upon Panic Alarm.

An alarm integration time for this type of alarm loops can be 70 ms or 300 ms depending on the programmed value of the **300-ms Integration Time** parameter.

Table 4.2 matches current resistance values and corresponding states of alarm loops of the Type 11.

Panic buttons are connected into an alarm loop of the Type 11 similarly to connecting intrusion alarm detectors into alarm loops of the Type 4 (see Appendix D).

Type 12: Programmable Auxiliary Alarm Loop

This type of loop monitoring methods can be used to monitor the conditions of various equipment and detectors, including those which are not related directly with fire and intrusion alarms. Any detectors or devices with dry contact or open collector outputs can be included into an alarm loop of the Type 12.

A Programmable Auxiliary alarm loop can be in one of five different states which match each to its own resistance range. These states and resistance values matched with them are user programmable. Accordingly, if a device can be in one of some different conditions and has several output contacts, this device can be monitored by means of a single alarm loop. In such case the output contact of the device must be included into the alarm loop along with different additional or shunt resistors. By such a manner the loop can be also monitored for short and open failures.

Sound and light indication of the Signal-10 as well as the way this loop impacts on a related relay (that is, the executive program assigned with the relay) are defined by the states this loop can reach. Switching between states of a Programmable Auxiliary alarm loop is defined only by changing its resistance and is not affected by any other loop parameters or network controller commands. The integration time for switching between states is generally equal to 300 ms. But if an alarm loop of the Type 12 has entered such status as Armed, Disarmed, Auxiliary Loop Restored, or any other "… Restored", the integration time for this status is equal to a programmed **Arming Delay** value.

A Programmable Auxiliary alarm loop is *always* monitored and cannot be blocked or disarmed. If the arming command addressed to this loop is received, the Signal-10 responds with a message about its current status.

When the states of alarm loops of the Types 12 are changed the Signal-10 transmits the network controller relevant messages. The events due to Programmable Auxiliary alarm loops are not stored in the nonvolatile memory of the Signal-10 similarly to events for loops of the Type 6.

Type 14: Fire Threshold Addressable Alarm Loop

The Signal-10 provides operating of alarm loops of the Type 14 with Bolid manufactured threshold addressable detectors and call points in threshold addressable mode. Refer to Section 4.1.5 to get more information about this type of alarm loops.

Type 16: Fire Manual Alarm Loop

Normally closed and normally open conventional call points can be brought into a Fire Manual alarm loop (Type 16). This loop is considered to be in one of the following states:

- Armed: The alarm loop is monitored, its resistance being normal;
- Disarmed (Disconnected): The alarm loop is not monitored;
- Arming Delay: The programmed Arming Delay has not yet expired;
- Fire 2 Alarm: A call point has been activated;
- Short Circuit: The resistance of the alarm loop is below 100 Ω;
- Open Circuit: The resistance of the alarm loop is more than 16 K;
- Arming Failed: An attempt to arm the loop has failed because the loop is activated.

The alarm integration time for an alarm loop of the Type 16 is to be defined in accordance with the requirements of Section 4.1.3.

Table 4.2 matches resistance values of alarm loops with their states.

The wiring diagram for including normally open call points into an alarm loop of the Type 16 is similar to the wiring diagram for smoke detectors (the Type 1) presented in Appendix D. For dry contact output detectors Ra = 1.5 K.

The wiring diagram for including normally closed call points into an alarm loop of the Type 16 is similar to the wiring diagram for heat detectors (the Type 3) presented in Appendix D. For dry contact output detectors Rsh = 4.7 K.

The **Arming Delay** (Exit Delay) parameter defines the time (in seconds), starting from the moment of the receiving the arming command, after elapsing of which the Signal-10 will really attempt to arm the alarm loop. Non-zero Arming Delay values are typically used for *Entrance* Alarm Loops (of the Type 7). Moreover, if one of the Signal-10 outputs is required to be activated before arming an alarm loop, for example, to unset power of 4-wire detectors by means of the ‘Switch On for a Time before Arming’ executive program, this alarm loop must obligatory have non-zero Arming Delay.

The **Alarm Delay** parameter in case of Entrance alarm loop (Type 7) represents the time which is to expire for the device to switch from the Entrance Alarm status to the Intrusion Alarm status (that is, the Entry Delay). Its value is selected by such way that it will be sufficient for a user to disarm the alarm loop after its activation (after entering the premises) without generating an alarm.

If when an alarm loop is being arming its resistance is below a normal value, for example, an included smoke fire detector has actuated, the Signal-10 automatically unsets the loop, that de-energizes it for 3 s. **Input Analysis Delay** for an alarm loop of any type is a pause which is to expire since the power has been restored and until the loop condition will be analyzed. This delay enables including into alarm loops the detectors with a high worm-up time (or high damping time). If such detectors are included into an alarm loop, it is necessary to program Input Analysis Delay for this alarm loop with some more value than the maximum worm-up time. The minimum hardware delay value is 1 s. This value can be increased up to 63 s.

The **Never Disarm** parameter disables disarming the alarm loop by any way. Typically, this parameter is set on for fire and intrusion alarm loops to avoid its accidental disarming.

Auto Rearming After Failing causes the Signal-10 to automatically arm the alarm loop which failed to be armed as soon as its resistance has been in norm within 1 s.

Auto Rearming After Alarm causes the Signal-10 to automatically switch the alarm loop from such conditions as Intrusion Alarm and Panic Alarm to the Armed status as soon as the alarm loop resistance is normal within the time equal to 15 times Alarm Delay in seconds.

Table 4.2. Alarm Loop Resistances for Different Alarm Loop States

Input Type	Alarm Loop State				
Type 1: Smoke Two-Threshold	Short Circuit	Fire Alarm (two or more smoke detectors have responded)	Fire Pre-alarm (a smoke detector has responded)	Norm	Open Circuit
	Less than 100 Ω	150 Ω to 1.56 K*	1.1 K* to 1.8 K	2.2 K to 5.4 K	More than 6.6 K
		* Depends on the loop load current			
Type 2: Fire Combined Single-Threshold	Short Circuit	Fire Prealarm / Fire Alarm (a smoke detector has responded)	Norm	Fire Prealarm / Fire Alarm (a heat detector has responded)	Open Circuit
	Less than 100 Ω	150 Ω to 1.8 K	2.2 K to 5.4 K	6.6 K to 14.4 K	More than 16 K
Type 3: Heat Two-Threshold	Short Circuit	Norm	Fire Prealarm (a heat detector has responded)	Fire Alarm (two and more heat detectors have responded)	Open Circuit
	Less than 1.8 K	2.2 K to 5.4 K	6.6 K to 11 K	12.5 K to 22.5 K	More than 25 K
Type 4: Intrusion	Norm		Intrusion Alarm		
	2.2 K to 10 K		Less than 1.8 K, or more than 12 K, or has jumped by more than 10 %		
Type 5: Intrusion with Tamper Monitoring	Norm	Intrusion Alarm	Tamper Alarm		
	2.2 K to 5.4 K	Less than 1.8 K, or more than 6.6 K (if armed)	6.6 K to 9.0 K, or less than 100 Ω, or more than 20 K (if the loop is in Disarmed, or Arming Delay, or Arming Failed states)		
Type 6: Auxiliary	Norm of Auxiliary alarm loop		Auxiliary Loop Alarm		
	2.2 K to 5.4 K		Less than 1.8 K or more than 6.6 K		
Type 7: Entrance	Norm		Entrance / Intrusion Alarm		
	2.2 K to 5.4 K		Less than 1.8 K, or more than 6.6 K, or has jumped by more than 10 %		
Type 11: Panic	Norm		Panic Alarm (Attack)		
	2.2 K to 5.4 K		Less than 1.8 K, or more than 6.6 K, or has jumped by more than 10 %		
Type 12: Programmable Auxiliary	Status 1*	Status 2*	Status 3*	Status 4*	Status 5*
	Less than R1*	From R1* to R2*	From R2* to R3*	From R3* to R4*	More than R4*
	* Alarm loop states and threshold loop resistance values are user programmable (see Section 5.4.2)				
Type 16: Fire Manual	Short Circuit	Fire 2	Norm	Fire 2	Open Circuit
	Less than 100 Ω	150 Ω to 1.8 K	2.2 K to 5.4 K	6.6 K to 14.4 K	More than 16 K

Disarmed Input Monitoring causes the Signal-10 to monitor the alarm loop also in the Disarmed status. If the resistance of the loop is normal, the Signal-10 transmits the network controller a READY TO ARM message, otherwise, if the loop is activated, a NOT READY TO ARM message is transmitted. The integration time for activation of a disarmed loop 300 ms, while to consider the disarmed loop as being in norm the integration time is equal to the **Alarm Delay** value.

The **Relay 1…4 Control** parameters relates alarm loops to required relay outputs of the Signal-10. If states of an alarm loop must effect on conditions of one or several outputs, the relevant parameter for the alarm loop must be set on.

If an output of the Signal-10 must be activated by remote commands of a network controller (that is, in case of centralized control), then the relevant control parameter for this output must be set off for all the alarm loops of the Signal-10.

If changing of alarm loop state must lead to switching of any relay output in accordance with an assigned executive program, switching will be delayed for a time given for the loop by a **Relay 1…4 Activation Delay**. For some particular executive programs such as 9 (*Lamp*), 10 (*Alarm Output*), 13 (*Fire Output*), 14 (*Trouble Output*), 15 (*Fire Lamp*), and 16 (*Alarm Output 2*) **Relay Activation Delay** is ignored and the relay output is switched immediately after changing loop status.

Fire Input Requery Prohibition, being set on, disables the function of the repeated query of the conditions of the alarm loops of Types 1 and 2 after a detector within the loop has actuated. Thus, if Fire Input Requery Prohibition is set on, actuating of a single fire detector within the alarm loop will immediately switch the loop to the Fire Prealarm status.

The **300-ms Integration Time** parameter enables setting the integration time for intrusion alarm loops (of the Types 4, 5, 7, and 11). The value “On” corresponds to the integration time equal to 300 ms, while the “Off” one corresponds to that equal to 70 ms. In order to decrease false alarms the integration time of 70 ms must be selected only if it is strongly necessary.

10% Deviation Blocking disables intrusion alarm loop’s analysis in case of sharp distinctions of loop resistance (more than by 10% from a steady-stated value) not skipping out of the normal range. It is advisable to set this parameter on for such alarm loops which involve detectors producing high voltage ripples in the alarm loop.

4.1.3. Short-time activations of alarm loops during which the Signal-10 doesn’t enter alarm modes (except for threshold-addressable alarm loops of the Type 14) can last:

- Up to 50 ms for an intrusion alarm loop if 300-ms Integration Time is set off for this loop;
- Up to 250 ms for other alarm loops and that intrusion alarm loops for which 300-ms Integration Time is on.

Time of activations of alarm loops which are considered as alarms are:

- 70 ms and more for an intrusion alarm loop if 300-ms Integration Time is set off for this loop;
- 300 ms and more for an intrusion alarm loop or alarm loop of the Type 12 if 300-ms Integration Time is set on for this loop.

For alarm loops of the Types 1, 2, 3 the time of activation of the alarm loop which causes the Signal-10 to enter the Alarm status can be from 300 ms to 3 s depending on transient processes within the loop. If high capacity detectors are included into the alarm loop, the Alarm Integration Time increases inversely to transient process rate. The minimum loop voltage change rate corresponding to maximum Alarm Integration Time is 0.5 V/s.

4.1.4. The Signal-10 provides powering two-wire current-consuming intrusion and fire detectors over the alarm loops.

The number of the detectors to be brought into a single alarm loop of the Signal-10 is estimated by formula:

N = Im / i, where:

N stands for the number of the detectors in an alarm loop;

Im stands for the maximum load current;

Im = 3 mA for alarm loops of Types 1, 4, 6, 7, 11, 12 and Im = 1.2 mA for alarm loops of Type 2;

i stands for the current in mA consumed by a detector in quiescent mode.

If an alarm loop of the Type 1 (fire smoke) is in use, fire detectors must keep their operability upon lowering the voltage until 12 V.

4.1.5. The Signal-10 supports operating with the following fire threshold addressable detectors:

– DIP-34PA smoke detectors;
– S2000-IP-PA heat detectors;
– IPR 513-3PA manual call points.

While connecting the above mentioned detectors, the relevant input of the Signal-10 shall be configured with the Type 14, Fire Threshold Addressable Alarm Loop and the numbers of connected detector and call points (1…10) shall be specified. A single input of the Signal-10 can be connected with up to 10 addressable detectors, each being able to respond with its current status to the Signal-10 request. The Signal-10 periodically polls connected addressable detectors and call points providing monitoring their operability and detecting failures and alarms. A response time of each detector doesn't exceed 10 s.

The Signal-10 recognizes the following messages/conditions of the addressable detectors and call points:

– OK;
– Dusty, Service Required;
– Trouble;
– Fire Alarm;
– Manual Fire Alarm;
– Test;
– Isolated.

Each threshold addressable detector or call point included into an alarm loop of the Type 14 is considered as an additional virtual input of the Signal-10. The digital number of a virtual input is formed by the following way:

– Numbers 20-29 relate to detectors connected to the input 1;
– Numbers 30-39 relate to detectors connected to the input 2;
– Numbers 40-49 relate to detectors connected to the input 3;
– Numbers 50-59 relate to detectors connected to the input 4;
– Numbers 60-69 relate to detectors connected to the input 5;
– Numbers 70-79 relate to detectors connected to the input 6;
– Numbers 80-89 relate to detectors connected to the input 7;
– Numbers 90-99 relate to detectors connected to the input 8;
– Numbers 100-109 relate to detectors connected to the input 9;
– Numbers 110-119 relate to detectors connected to the input 10.

Each additional virtual input can be disarmed (disabled) or armed with the help of a remote command of the network controller.

Arming or disarming a physical input (a fire threshold addressable alarm loop) automatically results in arming or disarming of all addressable detectors connected to this input.

The inputs can be combined to zones.

A current condition of an input (alarm loop of the Type 14) is formed as a generalized condition of all the threshold addressable detectors and call points connected into the loop. If the input belongs to a zone then to form the Fire 2 Alarm conditions all the conditions of all the inputs (fire threshold addressable alarm loops) of the zone are considered. Following are all possible generalized conditions of an input (threshold addressable loop) in the order of priority of conditions of the threshold addressable detectors and call points:

– Fire 2 Alarm: At least one addressable call point is in the Manual Fire Alarm status or two or more detectors connected to the same input or combined into the same zone enter the Fire Alarm status for the time 120 seconds maximum;
– Fire 1 Alarm: At least one addressable detector is in the Fire Alarm status;
– Disconnected: At least one addressable detector is in the Isolated status;
– Trouble: At least one addressable detector is in the Trouble status;

- Arming Failed: At the moment of arming, at least one addressable detector in the loop was in a state other than OK;
- Dusty Sensor, Service Required: At least one addressable detector is in the Dusty status;
- Disarmed: At least one addressable detector within the alarm loop has been disarmed, all other detectors of the loop being armed;
- Armed: All addressable detectors and call points are OK and armed.

If the Signal-10 has not received a response from an addressable detector within 10 s it assigns *Isolated* status to this virtual input. In such case the function of breaking the loop to remove the detector from its mounting base can be avoided and all other detectors in the loop keep their operability. No termination resistor is included into a fire threshold addressable alarm loop. The loop can be of any topology such as a bus, a ring, a star, or any hybrid topology.

While programming the Signal-10, it is necessary to specify in advance the addresses of those detectors which will be included into this threshold addressable alarm loop. It is implemented by the Connected Addressable Devices parameter setting. If matching of a detector number to a particular alarm loop is missed, then this detector is not considered when a generalized status of the alarm loop is formed and is not affected by arming/disarming commands while the loop is armed / disarmed.

The following configuration parameters have no effect on alarm loops on the Type 14:

- Alarm Delay;
- Arming Delay;
- Input Analysis Delay;
- Never Disarm;
- Auto Rearming After Failing;
- Auto Rearming After Alarm;
- Disarmed Input Monitoring;
- Fire Input Requery Prohibition;
- 300-ms Integration Time;
- 10% Deviation Blocking.

4.2. Outputs

Table 4.3 shows programmable parameters of the Signal-10 outputs.

Table 4.3. Configuration Parameters of Outputs

Parameter	Description	Value
Control Program	Defines the initial relay on/off condition and the way the output will be controlled depending on the status of the alarm loops related with this output	1…37, 50…53
Relay Activation Time	Defines the time interval for which the relay will be switched on/off if the assigned control program implies the limited activation time	0 s to 8192 s (up to 2 hours 16 minutes 32 s) in increments of 0.125 s
Relay ON / OFF Events	Enables/disables sending events when the relay state has changed. These events can be indicated by external indicator modules and registered in the system log	On / Off
Monitor For	Defines tactics to monitor external circuits of the outputs SRN (the relay 3) and LMP (the relay 4)	1 – Without Monitoring; 2 – Open Failure; 3 – Short Failure; 4 – Open and Short Failure

The Signal-10 outputs ALR1, ALR2, SRN, and LMP can be controlled in two ways:

- Locally in accordance with an assigned control program depending on statuses of related alarm loops (see below);
- Remotely (centrally) by network controller commands.

To control an output automatically depending on conditions of the related alarm loop/loops the output shall be associated with the relevant alarm loop/loops via the configuration parameters **Relay 1…4 Control**. Also for each of the outputs the parameters **Relay Activation Delay** and **Relay Activation Time** shall be defined and a **Control Program** shall be selected.

A **Control Program** defines the method the relay output will be controlled depending on current status of the alarm loops related with the relay output (local control) and the initial condition of the relay after powering-on the Signal-10. Table 4.4 describes all available control programs for the Signal-10 outputs.

A **Relay Activation Time** gives the time interval the relay will be activated for (switched on or off) if the assigned executive program implies the limited activation time. The maximum time interval the relay can be activated for is 65535 intervals of 0.125 s each (8192 s or 2 hours and 16 minutes and 32 seconds).

For all the control programs except #9, #10, #13, #14, #15, #16 (see Table 4.4), switching the relay output on (off) upon the alarm loop status changing can be delayed for the time given by the relevant **Relay Activation Delay** value for each the alarm loop. Therefore, a relay output can be activated at different times depending on the particular alarm loop which status changing switches the relay and the Relay Activation Delay value specified for this loop.

For control programs #1 – #8, #50 – #53 (general purpose programs), #11 (ASPT), #12 (Siren), #33 (ASPT-1), #34 (ASPT-A), #35 (ASPT-A1) breaking an Auxiliary alarm loop (of the Type 6) related with an output disables switching this output on. If upon recovering of the Auxiliary alarm loop the conditions for switching the relay on due to other alarm loops remain in force then for the executive programs with unlimited activation time (#1, #2, #5, #6) as well as programs #11 (ASPT) and #33 (ASPT-1) the relay output will be switched on again, but for the executive programs #3, #4, #7, #8, #12, #34, #35 the output will NOT be switched on. Thus, breaking of an Auxiliary alarm loop stops execution of the general purpose programs with unlimited activation time as well as the programs *ASPT* and *ASPT-1*, and cancels execution of the general purpose programs with a restricted activation time as well as programs *Siren*, *ASPT-A*, *ASPT-A1*.

If in a Signal-10 configuration a relay output is related to an alarm loop status then remote control commands of the network controller over RS-485 interface will be ignored. *Local control of relay outputs is more significant than centralized control.*

To enable centralized control for a Signal-10 relay output:

- In alarm loop settings, break an association between the output and any alarm loop of the Signal-10 (that is, the **Relay … Control** parameters for this output must be set OFF for all the alarm loops of the Signal-10);
- In output settings, assign this relay output to any **Control Program** with a suitable initial relay on/off condition;
- In the network controller database, assign the output with relevant Orion system partitions and give a required executive program along with a proper activation time and activation delay.

The **Monitor For** parameter defines for outputs SRN and LMP the kinds of troubles of external load circuits connected to these outputs which will be monitored during Signal-10 operating. The failures such as open circuit failures, short circuit failures, or both open and short failures are monitored without regard to whether the relay output is switched on or off. States of the monitored circuits are shown in Table 4.5.

The **Relay ON/OFF Events** parameter can be set on individually for each relay output. If the parameter is set on then any change in output condition with the current state of the output is transmitted to the network controller.

Table 4.4. Programs to Control Outputs

No.	Program	Description	Initial Condition
0	Remote Control	The relay is controlled only remotely	Off
1	Switch On	The relay is switched on if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	Off
2	Switch Off	The relay is switched off if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	On
3	Switch On for a Time	The relay is switched on for a specified time if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	Off
4	Switch Off for a Time	The relay is switched off for a specified time if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	On
5	Blink (Off Is Initial Position)	The relay is switched on/off once per second if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	Off
6	Blink (On Is Initial Position)	The relay is switched on/off once per second if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	On
7	Blink for a Time (Off Is Initial Position)	The relay is switched on/off once per second for a specified time if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	Off
8	Blink for a Time (On Is Initial Position)	The relay is switched on/off once per second for a specified time if there is an Intrusion Alarm or Fire 1 Alarm (Fire 2 Alarm)	On
9	Lamp	In case of a Fire 1 Alarm (Fire 2 Alarm) the relay is switched on/off alternately twice per second In case of a Fire Prealarm the relay is switched on for a short time every second In case of an Intrusion Alarm, or Entrance Alarm, or Arming Failed the relay is switches on/off alternately once per second In case of a Trouble the relay is switched on for a short time once per two seconds If an alarm loop is armed the relay is switched on If all alarm loops are disarmed the relay is switched off	*

No.	Program	Description	Initial Condition
10	Alarm Output 1	If all the alarm loops related with the relay are armed then the relay is switched on, otherwise the relay is switched off	*
11	ASPT	The relay is switched on for a given time if two or more alarm loops related with the relay have Fire 1 Alarm status or there are alarm loops in Fire 2 Alarm status and there are no Auxiliary loops broken. The broken Auxiliary loop will block switching on. If the Auxiliary loop is broken while the Relay Activation Delay has not yet expired then, after recovering of the loop, the relay output will be switched on for a specified time. (That is, breaking of the Auxiliary loop temporary blocks counting of activation delay.)	Off
12	Siren	In case of a Fire 1 Alarm (Fire 2 Alarm) the relay is switched on/off for a specified time in mode 'On for 1.5s and Off for .5s' In case of a Fire Prealarm the relay is switched on/off for a specified time in mode 'On for .5s and Off for 1.5s' In case of an Intrusion Alarm the relay is switched on for a specified time Otherwise the relay is off	Off
13	Fire Output	If the related loop has Fire 1 Alarm (Fire 2 Alarm) or Fire Prealarm status then the relay is switched on, else the relay is switched off (open)	*
14	Fault Output	If there are related alarm loops having Trouble, Arming Failed, or Disarmed status, the relay is switched off. Otherwise the relay is switched on	*
15	Fire Lamp	In case of a Fire 1 Alarm (Fire 2 Alarm) the relay is switched on/off twice per second in mode 'On for .25s and Off for .25s'; In case of a Fire Prealarm the relay is switched on/off once per second in mode 'On for .25s and Off for .75s'; In case of an Intrusion Alarm, Entrance Alarm, or Arming Failed the relay is switched on/off once per second (On for 0.5 s and Off for 0.5 s); In case of a Trouble the relay is switched on/off once per 2 seconds in mode 'On for .25s and Off for 1.75s'; If all the alarm loops related with the relay are armed the relay is switched on; Otherwise, the relay is switched off	*
16	Alarm Output 2	If all the alarm loops related to the relay are armed or disarmed (that is, there is neither Intrusion Alarm, nor Panic Alarm, nor Entrance Alarm, nor Fire 1 Alarm (Fire 2 Alarm), nor Trouble, nor Arming Failed condition) the relay is switched on, otherwise the relay is switches off	*
17	Switch On for a Time before Arming	If the related alarm loop is being armed (the Arming Delay has not yet expired) the relay is switched on for a given time	Off
18	Switch Off for a Time before Arming	If the related alarm loop is being armed (the Arming Delay has not yet expired) the relay is switched off for a given time	On
19	Switch On for a Time upon Arming	If any related alarm loop has just been armed the relay is switched on for a given time	Off
20	Switch Off for a Time upon Arming	If any related alarm loop has just been armed the relay is switched off for a given time	On

No.	Program	Description	Initial Condition
21	Switch On for a Time upon Disarming	If any related alarm loop has just been disarmed the relay is switched on for a given time	Off
22	Switch Off for a Time upon Disarming	If any related alarm loop has just been disarmed the relay is switched off for a given time	On
23	Switch On for a Time if Arming Failed	If arming of any related alarm loop has just failed the relay is switched on for a given time	Off
24	Switch Off for a Time if Arming Failed	If arming of any related alarm loop has just failed the relay is switched off for a given time	On
25	Switch On for a Time upon Auxiliary Alarm	If there is an Auxiliary Alarm the relay is switched on for a given time	Off
26	Switch Off for a Time upon Auxiliary Alarm	If there is an Auxiliary Alarm the relay is switched off for a given time	On
27	Switch On upon Disarming	If at least one related loop is disarmed the relay is switched on	Off
28	Switch Off upon Disarming	If at least one related loop is disarmed the relay is switched off	On
29	Switch On upon Arming	If at least one related loop is armed the relay is switched on	Off
30	Switch Off upon Arming	If at least one related loop is armed the relay is switched off	On
31	Switch On upon Auxiliary Alarm	In case of an Auxiliary Alarm the relay is switched on	Off
32	Switch Off upon Auxiliary Alarm	In case of an Auxiliary Alarm the relay is switched off	On
33	ASPT-1	The relay is switched on for a specified time if the alarm loop has got Fire 1 Alarm (Fire 2 Alarm) status and there are no responded Auxiliary alarm loops. If an Auxiliary alarm loop is activated before Relay Activation Delay has not yet expired then, when the loop is recovered, the relay output will be switched on for a specified time. (That is, activation of the Auxiliary loop temporary blocks counting of the activation delay.)	Off
34	ASPT-A	The relay is switched on for a specified time if two or more alarm loops related with the output have got Fire 1 Alarm status or there are alarm loops in Fire 2 Alarm status and there are no responded Auxiliary alarm loops. A broken Auxiliary loop cancels activation of the relay, that is, the Auxiliary loop being recovered, the output will NOT be switched on	Off
35	ASPT-A1	The relay is switched on for a specified time if the alarm loop has got Fire 1 Alarm (Fire 2 Alarm) status and there are no responded Auxiliary alarm loops. A broken Auxiliary loop cancels activation of the relay, that is, the Auxiliary loop being recovered, the output will NOT be switched on	Off
36	Switch On If Temperature Increased	If the alarm loop has got the High Temperature ** status the relay is switched on	Off
37	Switch On If Temperature Decreased	If the alarm loop has got the Low Temperature ** status the relay is switched on	Off
50	Switch On for a Time upon Fire 2 Alarm	Switch on for a given time in case of a Fire 2 Alarm	Off
51	Switch Off for a Time upon Fire 2 Alarm	Switch off for a given time in case of a Fire 2 Alarm	On

No.	Program	Description	Initial Condition
52	Blink for a Time (Off Is Initial Position) upon Fire 2 Alarm	Switch on and off alternately (0.5 s on and 0.5 s off) for a given time in case of a Fire 2 Alarm	Off
53	Blink for a Time (On Is Initial Position) upon Fire 2 Alarm	Switch on and off alternately (0.5 s on and 0.5 s off) for a given time in case of a Fire 2 Alarm	On

NOTES:

* The relay performance is defined by conditions of the group of related alarm loops;

** Only that alarm loop which is programmed with the Type 12 (Auxiliary Programmable) can enter the High Temperature or Low Temperature condition

Table 4.5. Output Circuit Conditions Depending on Effective Loading Resistance

OK		Open Circuit		Short Circuit	
Output is on	Output is off	Output is on	Output is off	Output is on	Output is off
26 Ω to 10 K		More than 12 K (supply voltage 12 V) More than 25 K (supply voltage 24V)	More than 10 K	Less than 24 Ω	Less than 24 Ω

4.3. Signal-10 Parameters

The configuration parameters of the Signal-10 define its specific operation features and give its network settings while working as part of an Orion security system.

The configuration parameters of the Signal-10 are shown in Table 4.6.

Table 4.6. Configuration Parameters of the Unit

Parameter	Description	Value Range
1	2	3
Both Power Inputs Monitoring	Defines the condition upon which the device will switch to the Power Failure mode: upon a both power inputs failure or upon a single input failure	On / Off
EN54	Provides indicating fire alarm loop states in accordance with EN54-2 standard requirements	On / Off
Sound Signaling	Enables / disables sound signaling of the unit	On / Off
Network Address	Defines the network address of the unit within a RS-485 highway	1…127
Response Pause	Defines the admissible delay for the unit to respond to a network controller request	From 1.5 ms to 500 ms incremented by 0.125 ms

4.3.1. The parameter **Both Power Inputs Monitoring** defines the conditions for the Signal-10 to switch to the Power Failure mode: upon a power failure of a single input or both power inputs.

If Both Power Inputs Monitoring is set on, the Signal-10 switches to the Power Failure mode when power input voltage has dropped below 10 V at any single power input. The Signal-10 will come back to the Operation mode when the voltage has been above 11 V at both power inputs.

If Both Power Inputs Monitoring parameter is set off, the Signal-10 keeps the Operation mode still the power voltage exceeds 10 V at least at a single power input and switches to the Power Failure mode if the power voltage has dropped below this value. The Signal-10 returns to the Operation mode when the power voltage of at least one power input has reached to 11 V.

4.3.2. The **EN54** parameter defines the way for fire alarm loop (of the Types 1, 2, 3, 14) states to be displayed by the relevant unit indicators. If the parameter is set off, displaying such main states as Armed, Disarmed, Arming Failed and so on for fire alarm loops is similarly to that for intrusion alarm loops.

If the EN54 parameter is set on, states of fire alarm loops are displayed by the following way:

- To display the Armed status the related LED is off;
- To display the Disarmed status the related LED shows solid amber light;
- To display the Arming Failed status the related LED flashes with amber;
- To display alarm states such as Fire Signal, Fire Prealarm, Fire 1 Alarm, Fire 2 Alarm the related LED flashes with red.

Refer to Table 5.4 to get more information about performance of the alarm loop indicators.

4.3.3. The **Sound Signaling** parameter provides enabling and disabling sound signaling of the Signal-10.

4.3.4. The **Network Address** parameter is intended for unique identification of the Signal-10 as a specific part of an Orion system. The Signal-10 transmits messages from and receives network address commands to the address defined by this parameter. The Network Address value must be unique for each device connected to an Orion network controller.

4.3.5. Setting the **Response Pause** parameter provides using the device within a system with a sophisticated network topology where long layover can be, for example, while converting RS-485 data into other interfaces intended for transmission over local area networks, fiber optic channels, or radio channels.

4.3.6. Current values of Network Address and Response Pause can be reset to factory (default) values by pressing the device tamper switch with a special way: long–long–long–short. ‘Long pressing’ means pressing and holding the tamper switch pressed for more than 1.5 s, while ‘short’ one means pressing and holding the tamper switch pressed for the time between 0.1 s to 0.5 s. The pause between pressings must last from 0.1 s to 0.5 s.

To program the Signal-10 for operation within a specific installation and make the best use of its functions, any parameter of the Signal-10, its inputs and outputs can be changed. To do so, UProg configuration Tool is used.

4.4. Electronic Keys

The Signal-10 provides reading, registering, deleting and changing parameters of the following types of electronic keys (credentials) or ID numbers:

- Master Keys;
- User Keys.

The codes of credentials are read automatically when electronic keys touch the external reader.

4.4.1. Each User Key provides combining some alarm loops to a single group and operates this group (arms and disarms them) as a whole. The User Key can have the following rights to operate each alarm loop in the group:

- Right to arm and disarm;
- Right only to disarm (arming is prohibited);
- Right only to arm (disarming is prohibited).

The combination of rights assigned to a key for each alarm loop is called *Key Status*.

The maximum number of the keys which can be stored in the unit’s non-volatile memory is 85.

4.4.2. A Master Key is used by a person who maintains and adjusts facilities. After identification of a Master Key the following operations are available for it:

- Adding new User Keys;
- Changing authorities of the existing User Keys.

A Master Key cannot arm or disarm alarm loops and change configuration parameters of the Signal-10.

Procedures of programming the keys are described in Section 5.6.

4.5. Operation Modes of the Signal-10

The Signal-10 provides operation in the following modes:

- Pre-Operation;
- Operation;
- Power Failure;
- Output Circuit Failure;
- Master Key Programming;
- User Key Programming;
- Indication Test;
- Self-Diagnostic;
- Device Failure.

Performance of READY LED for various operation modes of the Signal-10 can be shown in Table 4.7.

4.5.1. The Signal-10 proceeds from de-energized state to the Pre-Operation mode when power has been applied to its input power terminals. The duration of the Pre-Operation mode meets the requirements of Section 1.10.

4.5.2. On termination of the Pre-Operation mode the Signal-10 enters the Operation mode performing its main functions such as monitoring and analysis of alarm loop conditions, controlling the relays and internal light and sound alarms, communicating data with the network controller.

The device confirms its having switched to the Operation mode by playing a melody.

4.5.3. When supply voltage drops below 10 V at one or both power inputs, the unit proceeds from the Operation mode to the Power Failure mode (see Section 4.3.1). In this mode the Signal-10 continues performing its main functions but issues warning signals about the trouble by READY LED light indication and built-in sounder's beeping.

If supply voltage drops below 9 V at both power inputs, the unit switches off.

If supply voltage increases up to 11V at any power input or both power inputs (see Section 4.3.1), the unit automatically switches from the Power Failure mode to the Operation mode and generates a POWER RESTORE message.

4.5.4. When a short circuit or an open circuit occurs between external executive devices and LMP or SRN outputs the device switches to the Output Circuit Failure Mode.

In this mode the device completely retains operation, but READY LED flashes with red and the built-in sounder beeps.

After the failure has been repaired the Signal-10 automatically enters the Operation mode.

4.5.5. The unit can be switched from the Operation mode to the Master Key Programming mode by performing a special press combination on the unit tamper switch. See Section 5.6 to get more information.

4.5.6. The unit can be switched from the Operation mode to the User Key Programming mode by touching the reader with a Master Key. To get more information about this operation mode please see Section 5.7.

4.5.7. The Signal-10 can be switched from the Operation mode to the Indication Test mode.

In this mode the unit checks operability of its light indicators and the sounder. This mode is described in Section 5.8.4.

4.5.8. The Signal-10 can be switched from the Operation mode to the Self-Diagnostic mode.

In this mode the unit checks operability of its light indicators, the sounder, and the outputs. This mode is described in Section 5.8.5.

4.5.9. The Signal-10 proceeds to the Device Failure mode if a checksum error has been found during a microcontroller memory test. The unit performs a memory test every time when power is applied to it.

When the unit enters the Device Failure mode:

- READY LED flashes in red once per two seconds;
- The unit's sounder plays a low tone sounds synchronously with READY LED;
- Indicators «1» – «10» are off;
- The unit ignores activation of its alarm loops, pressings on its tamper switch, presenting an iButton to the connected reader.

Try to switch power off and on again, and if a checksum error has been found once more then update firmware of the Signal-10. For doing so:

1. *Connect the unit to a PC via one of the Bolid manufactured interface converters such as S2000M in programming mode, PI-GR, S2000-PI, S2000-USB, or USB-RS485. Use terminals «A» and «B» for connection.*
2. *Apply power to the unit.*
3. *Update the unit's firmware using ORION_PROG.exe software.*

While firmware is being written to the unit's memory the sounder is off and READY LED indicates the process of updating. Writing having been completed, the unit should proceeds to the Pre-Operation mode.

Note: ORION_PROG.exe and the firmware file can be downloaded from the site of the Bolid Company at the address of **http://bolid.ru.**

Table 4.7. READY LED Performance for Different Operation Modes of the Signal-10

No.	Operation Mode	READY LED Performance
1	Pre-Operation	Off
2	Operation	Shows solid green light
3	Master/User Key Programming	Flashes doubly with green once per second
4	Power Failure	Flashes with amber once per second: On for 0.125 s / Off for 0.875 s
5	Self-Diagnostic	Flashes with red twice per second: On for 0.25 s / Off for 0.25 s
6	Device Failure	Flashes with red once per two seconds: On for 1 s / Off for 1 s
7	Output Circuit Failure	Flashes doubly with amber every second

5 Operation

5.1. Preparation for Use

5.1.1. Safety Precautions:

– There are no potential hazard circuits within the Signal-10;
– Do SHUT OFF power prior to mounting, wiring, and maintaining the Signal-10;
– The Signal-10 should be mounted and maintained by competent specialists with the relevant electrical safety qualification level.

5.1.2. Mounting of the Signal-10:

– The unit is intended to be installed in cabinets, on walls or other structures of protected premises at places protected against atmospheric fallouts and mechanical damage;
– Attach the unit within a cabinet or on a wall at a convenient place. If the Signal-10 is installed within a non-secure premises it should be attach at a height at least 2.2 m above the floor;
– Mounting the module follow all your local applicable codes, standards, regulations, and ordinances;
– Mount and wire the Signal-10 in accordance with a schematic in Appendix B.

If SRN or LMP output is not in use connect a resistor 1.0…8.2 K – 0.25 W across output contacts.

5.1.3. Wiring the RS-485 Interface Line.

Connect the Signal-10 to the network controller via the RS-485 interface bus by doing the following:

– Couple the device terminals RS485A and RS485B with A and B wires of RS-485 bus respectively;
– Couple the 0V circuit of the Signal-10 with the similar circuits of the preceding and succeeding devices in the RS-485 highway (you can ignore this requirement if the devices are powered by the same power supply);
– If the Signal-10 is *neither the first nor the last device* within RS-485 highway, remove the jumper that is located closely to the RS485A and RS485B contacts on the unit's PCB. (This jumper, if put on, includes the EOL resistance of 620 Ω into the RS-485 interface line.).

While mounting the RS-485 interface line, it is advisable to arrange the *bus* network topology (that is, connect the devices in a chain). If a long-distance branch (more than 50 m from the RS-485 bus) needs to be arranged, a Bolid S2000-PI interface repeater is to be included at the cross point. It can be brought up to ten S2000-PI interface repeaters in a single RS-485 bus segment (up to ten branches can be made). The number of successively included repeaters is not limited.

5.1.4. Changing Default Configuration of the Unit.

If the Signal-10 will be operated along with other devices in an Orion system it shall be assigned with a *unique* (different from these ones for other devices) network address in the range of 1 to 127. For doing so, connect the Signal-10 to the network controller *(other devices must be disconnected from the network controller at this time)* and change the network address, for example by means of UPROG.EXE software utility.

To adjust the Signal-10 for operating within a specific installation and to use its capability optimally, some configuration parameters of the unit can probably need to be changed.

The configuration parameters of the Signal-10 on receipt are set on as shown in Tables 5.1, 5.2, 5.3.

Table 5.1. Factory Values of Signal-10 Parameters

No.	Parameter	Factory Value
1	Both Power Inputs Monitoring	Off
2	EN54	On
3	Sound Signaling	On
4	Network Address	127
5	Response Pause	1.5 ms

Table 5.2. Factory Alarm Loop Configuration

	Configuration Parameters (see Note)																			
	№	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alarm Loops	1	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	2	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	3	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	4	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	5	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	6	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	7	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	8	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	9	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-
	10	4	0	0	1	0	0	0	0	0	-	+	-	-	-	+	-	-	-	-	-

Notes:

1) The following parameters are designated by digits:
   - 1 - Input Type;
   - 2 - Zone number;
   - 3 - Arming Delay;
   - 4 - Input Analysis Delay;
   - 5 - Alarm Delay;
   - 6 - Relay 1 Activation Delay;
   - 7 - Relay 2 Activation Delay;
   - 8 - Relay 3 Activation Delay;
   - 9 - Relay 4 Activation Delay;
   - 10 - Never Disarm;
   - 11 - Auto Rearming After Failing;
   - 12 - Auto Rearming After Alarm;
   - 13 - Disarmed Input Monitoring;
   - 14 - Fire Input Requery Prohibition;
   - 15 - 300-ms Integration Time;
   - 16 - 10% Deviation locking;
   - 17 - Relay 1 (ALR1) Control;
   - 18 - Relay 2 (ALR2) Control;
   - 19 - Relay 3 (SRN) Control;
   - 20 - Relay 4 (LMP) Control.
2) The sign «+» in the table means that the parameter is set on while the sign «-» means that the parameter is set off.

Table 5.3. Factory Values of Parameters of Outputs

Parameter	Output			
	ALR1	***ALR2***	***SRN***	***LMP***
Control Program	10	10	12	9
Activation Time, s	8192	8192	120	8192
Relay ON/OFF Events	Off	Off	Off	Off
Monitored For	–	–	4	4

5.2. Fire Alarms

The Signal-10 operates in fire alarm mode if at least one of its inputs is programmed with Type 1, 2, 3, 14, or 16. The unit provides operating of the alarm loops connected to these inputs in following modes:

- Armed;
- Disarmed;
- Arming Delay;
- Arming Failed;
- Fire Prealarm;
- Fire 1 Alarm;
- Fire 2 Alarm;
- Trouble;
- Disconnected;
- Dusty, Service Required.

Light and sound indication of the Signal-10 is shown in Table 5.4 and Table 5.5.

5.2.1. An alarm loop is in the Armed mode if it was preliminary armed and all the detectors connected to the alarm loop are in quiescent mode. Short-time activation of the armed fire alarm loop doesn't cause the alarm loop to enter alarm mode if it takes less than 250 ms*.

5.2.2. If an alarm loop is configured with a non-zero Arming Delay then upon arming it proceeds in the Arming Delay mode. If during this time the alarm loop is activated the loop doesn't enter an alarm mode.

5.2.3. When an Alarm Delay has expired and if the resistance of the alarm loop is within the normal range then the alarm loops enters the Armed state. If Alarm Delay has expired but the resistance of the alarm loop is out of the normal range then the alarm loop enters the Arming Failed status.

If Auto Rearming After Failing is set on for the alarm loop* then the alarm loop automatically proceeds from the Arming Failed mode to the Armed mode as soon as the resistance is being in normal range for 1s and longer.

5.2.4. If the fire alarm loop* is activated for longer than 300 ms the Signal-10 recognizes activation of the alarm loop and switches it to one of the following modes:

- Fire Prealarm;
- Fire 1 Alarm;
- Fire 2 Alarm;
- Trouble.

The particular algorithm of switching depends on the type and configuration of the alarm loop (see Section 4.1.2).

* Except for threshold addressable alarm loops of Type 14.

5.3. Intrusion Alarms

Depending on the selected type of an alarm loop the Signal-10 provides operating in the following intrusion alarm modes:

- General intrusion alarms (Type 4 of alarm loop);
- Intrusion alarms and tamper alarms of the connected detector (Type 5 of alarm loops);
- Entrance alarms (Type 7 of alarm loops);
- Panic alarms (Type 11 of alarm loops).

The light and sound indication of the Signal-10 for intrusion alarm modes is shown in Table 5.4 and Table 5.5.

5.3.1. The Signal-10 operates in general intrusion alarm mode if at least one of its alarm loops is programmed with Type 4. In this mode the unit provides operating the alarm loops in the following modes:

- Armed;
- Disarmed;
- Arming Delay;
- Arming Failed;
- Intrusion Alarm.

5.3.1.1. The modes Armed, Arming Delay, and Arming Failed are similar to the same-name modes of fire alarm loops and are described in Sections 5.2.1 – 5.2.3. The duration of short-time activation of an armed intrusion alarm loop which doesn't cause the alarm loop to enter an alarm mode is:

- 50 ms if *300-ms Integration Time* is off;
- 250 ms if *300-ms Integration Time* is on.

5.3.1.2. An alarm loop of Type 4 switches from the Armed status to the Intrusion Alarm status if:

- The alarm loop has been activated for more than 70 ms, *300-ms Integration Time* being off;
- The alarm loop has been activated for more than 300 ms, *300-ms Integration Time* being on;
- The loop resistance has jumped by more than 10%, *10% Deviation Blocking* being off for this loop.

When the alarm loop has entered Intrusion Alarm status then relay control in accordance with #1 - #8 control programs can be activated (if programmed).

If *Auto Rearming After Alarm* is set on for the alarm loop then the loop will be automatically armed after its resistance being in the normal range for a time interval more than 15 times value of the Alarm Delay configured for the loop (in seconds).

5.3.2. The Signal-10 operates in intrusion alarm mode with monitoring tamper switch conditions is at least one of its alarm loops is configured with Type 5. For such loop the unit can recognize the following states:

- Armed;
- Disarmed;
- Arming Delay;
- Arming Failed;
- Intrusion Alarm;
- Short Circuit Failure;
- Tamper Alarm.

5.3.2.1. The modes Armed, Arming Delay, Arming Failed, Intrusion Alarm are similar to the relevant modes of an alarm loop of Type 4 (see Sections 5.3.1.1, 5.3.1.2).

5.3.2.2. An alarm loop of Type 5 proceeds from the Disarmed status to the Tamper Alarm status when the contacts of the detector tamper switch have been open for more than 300 ms.

When the detector's enclosure is closed for 15 s and the tamper switch contacts are being closed for all this time, the alarm loop again enters the Disarmed status.

5.3.2.3. An alarm loop of Type 5 switches from the Disarmed status to the Short Circuit Failure status when this failure has happened and held for more than 300 ms.

When the failure has been repaired for more than 3 s (the resistance of the loop has been within the normal range) the loop of Type 5 comes back to the Disarmed status.

5.3.3. The Signal-10 operates in the mode of entrance alarms if at least one of its alarm loops is programmed with Type 7. The unit provides operating of these alarm loops in the following modes:

- Armed;
- Disarmed;
- Arming Delay;
- Arming Failed;
- Entrance Alarm;
- Intrusion Alarm.

5.3.3.1. The modes Armed, Arming Delay, Arming Failed are similar to the relevant modes of alarm loops of Type 4 (see Sections 5.3.1.1).

5.3.3.2. An alarm loop of Type 7 proceeds from the Armed mode to the Entrance Alarm mode in cases described in Section 5.3.1.2.

5.3.3.3. An alarm loop of Type 7 proceeds from the Entrance Alarm mode to the Intrusion Alarm mode upon the expiration of the time equal to Alarm Delay.

The Intrusion Alarm mode is similar to the relevant mode for the alarm loops of Type 4 (see Section 5.3.1.2).

5.3.4. The Signal-10 operates in panic alarm mode if at least one of its alarm loops is programmed with Type 11. The unit provides operating of the alarm loops in following modes:

- Armed;
- Disarmed;
- Arming Delay;
- Arming Failed;
- Panic Alarm.

5.3.4.1. The modes Armed, Arming Delay, Arming Failed are similar to the relevant modes of alarm loops of Type 4 (see Section 5.3.1.1).

5.3.4.2. An alarm loop of Type 11 proceeds from the Armed status to the Panic Alarm status in cases described in Section 5.3.1.2.

Panic alarm mode of alarm loops is indicated only by the built-in indicators «1» – «10» of the Signal-10 and takes an effect only on the related relays programmed with the control programs Alarm Output 1 (10) or Alarm Output 2 (16) (the relay will be open). The internal sounder of the Signal-10 keeps silent.

If Auto Rearming After Alarm is set on for these alarm loops then the loops automatically proceed from the alarm mode to the Armed mode as soon as their resistance values are in normal range longer than 15 times value of the Alarm Delay configured for the loop (in seconds).

Table 5.4. Performance of the Alarm Loop LEDs for Various States

No.	Alarm Loop Status		LED Performance
1	Armed		Lit steady with green
			Off (see the Note below)
2	Disarmed		Off
			Lit steady with amber (see the Note below)
3	Arming Delay	Loop is OK	Flashes with green four times per second: On for 0.125 s / Off for 0.125 s
		Loop is activated	Flashes with amber four times per second: On for 0.125 s / Off for 0.125 s
4	Arming Failed		Turns on with green and turns off in following mode: On for 1 s / Off for 1 s
			Turns on with amber and turns off in following mode : On for 1 s / Off for 1 s (see the Note below)
5	Fire Signal		Flashes with green and red alternately
			Flashes with red once per second (see the Note below): On for 0.25 s / Off for 0.75 s
6	Fire Prealarm		Flashes with red once per second: On for 0.25 s / Off for 0.75 s
7	Fire 1		Flashes with red twice per second: On for 0.25 s / Off for 0.25 s
8	Fire 2		Lit steady with red
9	Intrusion Alarm, Entrance Alarm, Panic Alarm		Flashes with red once per second: On for 0.5 s / Off for 0.5 s
10	Tamper Alarm (Type 5)		Flickers with red once per second: On for 0.125 s / Off for 0.875 s
11	Trouble, Dusty, Disconnected		Flickers with amber once per second: On for 0.125 s / Off for 0.875 s

Note: – The performance of the LEDs mentioned above is relevant for fire alarm loops when the EN54 parameter is set on.

Table 5.5. Performance of the Built-in Sounder for Various Modes

No.	Alarm Loop Status	Sounder Performance
1	Armed	Off
2	Disarmed	Off
3	Arming Delay	Off
4	Arming Failed	Off
5	Fire Signal	Off
6	Fire Prealarm	Interrupted two-tone sound
7	Fire 1, Fire 2	Solid two-tone sound
8	Intrusion Alarm	Interrupted single-tone sound
9	Entrance Alarm	Off
10	Panic Alarm	Off
11	Tamper Alarm (Type 5)	High frequency interrupted single-tone sound
12	Trouble, Dusty, Disconnected	Beeps

5.4. Auxiliary Alarms

The Signal-10 enables monitoring and transmitting an Orion network controller the conditions of various technological circuits being not directly related to fire and intrusion alarms. Such circuits involve contacts of devices blocking automated fire–fighting systems, mass sensors, pressure sensors, flow sensors, throttle valves, liquid level controls and so on.

For these purposes the loops of Type 6 (Auxiliary) and Type 12 (Programmable Auxiliary) are used. Loops of these types can be neither armed nor disarmed: they are *always monitored* by the Signal-10.

5.4.1. Auxiliary loops of the Type 6 are considered to be in one of two available states, namely *Auxiliary Loop Alarm* and *Auxiliary Loop Restored* ones.

An alarm loop of the Type 6 switches from the Auxiliary Loop Restored status to the Auxiliary Loop Alarm status if the alarm loop is being activated for at least 300 ms.

Recovering of the activated alarm loop of the Type 6 (that is, switching from Auxiliary Loop Alarm to Auxiliary Loop Restored status) is implemented automatically if the resistance of this loop has come to the normal range and is held normal for the time interval equal to the Arming Delay parameter programmed for this loop.

Activation of an alarm loop of Type 6 disables control of related relays for a number of control programs:

- 1…8, 50 … 53 (general purpose programs);
- 11 (ASPT);
- 12 (Siren);
- 33 (ASPT-1);
- 34 (ASPT-A);
- 35 (ASPT-A1).

Disabling relay control in case of activation of the related alarm loop of Type 6 implies that:

- The relay is not switched on when the auxiliary alarm loop has been activated;
- The relay will be switched to its initial status for the control program if the relay was being controlled at the moment of auxiliary alarm loop response.

So, the relays controlled in accordance with programs 1…8, 11 (ASPT) and 33 (ASPT-1), will be again switched on when the auxiliary alarm loop is restored but the relays controlled in accordance with programs 34 (ASPT-A) and 35 (ASPT-A1) will remain switched off.

5.4.2. Programmable Auxiliary alarm loops of Type 12 have 5 available states defined by threshold values of alarm loop resistances. The figure below shows the distribution of available loop states and location of the resistance thresholds which define these states for particular equipment.

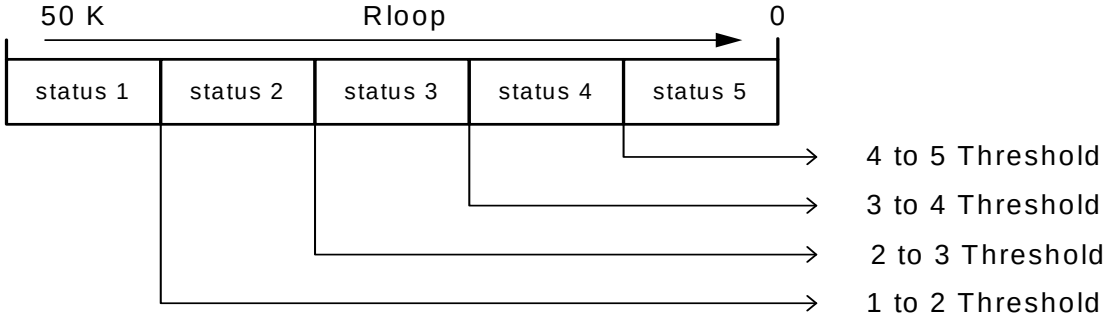


Figure 1. States and Thresholds for Transition between the States of Programmable Auxiliary Alarm Loops

Threshold values of resistance which define the transition bounds and meaning content of the particular statuses are user programmable. Accordingly, if a device can be in one of some different conditions and has several output contacts, this device can be monitored by means of a single alarm loop. In such case the output contact of the device should be included into the alarm loop along with different additional or shunt resistors. By such a manner the circuit can be monitored for short and open failures.

Light and sound indication of the unit as well as controlling the Signal-10 outputs are defined by the states a programmable auxiliary alarm loop can enter. Changing states of the programmable auxiliary

alarm loop is defined only by a variation of the loop resistance and is not affected by any other parameter or commands of the network controller. The integration time for switching between states is generally equal to 300 ms. But if an alarm loop of the Type 12 has entered such status as Armed, Disarmed, Auxiliary Loop Restored, or any other "… Restored", the integration time for this status is equal to a programmed Arming Delay value.

Table 5.6 shows status codes of states of programmable auxiliary alarm loops.

Table 5.6. Status Codes of Programmable Auxiliary Alarm Loops

Status Code	Status	Status Code	Status
1	AC Power Restored	76	High Temperature
2	AC Power Failed	77	Too Low Level
3	Intrusion Alarm	78	Normal Temperature
17	Arming Failed	82	Heat Sensor Failed
24	Armed	109	Disarmed
35	Auxiliary Loop Restored	118	Entrance Alarm
36	Auxiliary Loop Alarm	130	Pump On
38	Auxiliary Loop Alarm-2	131	Pump Off
39	Fire Equipment Restored	149	Tamper Alarm
41	Fire Equipment Trouble	152	Tamper Restored
44	Fire Prealarm	198	Power Failed
45	Loop Open Failure	199	Power Restored
58	Panic Alarm	200	Battery Restored
71	Low Level	202	Battery Failed
72	Normal Level	204	Service Required
74	High Level	206	Low Temperature
75	Too High Level	214	Loop Short Failure

5.4.2.1. While programming resistance thresholds for states of an alarm loop of the Type 12, it is necessary to know exactly the ranges of resistance for each state of the alarm loop. The resistance of an alarm loop can be estimated based on an ATD-value measured by the Signal-10 using the formula below:

$$R_{\text{loop}} = \frac{281}{ATD} - 1, \text{ [K]},$$

where **R_{loop}** is the actual resistance value in kiloohms of the alarm loop and
ATD is the ATD-value of the resistance measured by the Signal.

This formula enables estimating resistance values of the loop in the range from 0.1 K to 50 K with acceptable accuracy. Reading the ATD-values is provided either by S2000/S2000M console tools or by UProg Configuration Tool while programming the loop in the window for programming the loops of Type 12.

5.5. Arming and Disarming Alarm Loops

The Signal-10 provides arming and disarming of alarm loops in the following ways:

- Arming (disarming) of a group of alarm loops assigned with the same User Key;
- Group or individual arming (disarming) by commands of the network controller.

5.5.1. If at least one credential is registered in the non-volatile memory of the Signal-10, the user can arm or disarm all the group of the alarm loops which are related to this credential (User Key). To do so, touch the contact of the reader with the User Key. If the unit recognizes the code of the presented credential, it beeps and the alarms loops associated with this credential become armed or disarmed. If the read code is unknown for the Signal-10, the unit produces long sound tone indicating that the presented credential is rejected.

If the presented credential is authorized only to arm the related alarm loops then the loops cannot be disarmed by means of this key but they can be only armed again.

If the presented credential is authorized only to disarm the related alarm loops then the alarm loops cannot be armed by means of this credential but can only be disarmed again.

5.5.2. The Signal-10 enables the network controller to arm and disarm any of its alarm loops except for alarm loops of Type 6 and Type 12 and the alarm loops programmed with the attribute Never Disarm set on. On receiving a command to arm or disarm an auxiliary alarm loop the unit responds with a message about the current state of the alarm loop. Receiving a command to disarm an alarm loop with the Never Disarm parameter set on, the unit also responds with a message about the current state of the alarm loop.

The Signal-10 enables the network controller to operate (to arm and disarm) system partitions.

In case of centralized control of partitions codes of credentials (keys) are enrolled in the database of the network controller along with relevant authorities.*

When a credential has been read its code is transmitted over the RS-485 interface. The two-color LED of the reader starts flashing with red and green alternately five times per second until receiving a respond from the network controller (this can take from fractions of a second to a few seconds depending on the number of devices connected to the RS-485 interface).

If the presented credential is authorized to operate a partition, then the reader LED indicates the current state of the partition as shown in Table 5.7. On second presenting of this credential the partition is armed (if it was disarmed) or disarmed (for all other states). Each next presenting of the key to a reader leads to an action opposite to the previous one, i.e. if the 2-nd presenting of the key to the reader caused arming of the partition then the 3-rd presenting of the key to the reader will cause disarming of the partition. If the credential has limited access rights for the partition, for example, only arming is enabled, this key will always cause arming without regard to a current partition status.

Table 5.7. Indication of Partition Status by the Reader LED

Partition Status	Reader LED Performance	Color
Disarmed	Off	–
Armed	On	Amber (green + red)
Alarm, Fire 1, Fire 2, Prealarm, Arming Failed	Flashes twice per second	Amber
Trouble (in a fire partition)	Flashes five times per second	Amber

If the presented credential is not recognized by the network controller, or the credential is not authorized to operate the partition, or another credential is presented to the reader within the operation time of the current credential then the Signal-10 rejects access and the reader LED flashes three times with red.

* To get more information please refer to S2000M User's Manual, Section 2.1.7.3.

5.6. Programming Master Keys

The mode of programming Master Keys is intended for service personnel, responsible for adjustment and maintenance of the Signal-10. A Master Key can be programmed by one of two ways:

- Manually;
- By means of UPROG.EXE.

5.6.1. In order to switch the Signal-10 to the Master Key Programming Mode, press the unit tamper switch by a specific way: long pressing – short pressing – long pressing. If you successfully pressed the tamper switch as mentioned above, the Signal-10 plays the first part of the Programming melody while READY LED and the reader LED start flashing.

The following functions become available in Master Key Programming Mode:

- Deleting codes of all the credentials stored in the non-volatile memory of the Signal-10;
- Writing a code of the new Master Key into the non-volatile memory of the unit;
- Defining default authorities for User Keys.

Within 10 seconds since pressing the tamper switch touch the Signal-10 reader with an electronic key. If the Signal-10 successfully reads the code of the presented key, it deletes all memorized keys and writes the new key code to its memory with the Master attribute. Then the Signal-10 exits Master Key Programming Mode.

If the Signal-10 fails to read a code of the electronic key within 10 seconds, it automatically exits the Master Key Programming mode.

When exiting the Master Key Programming Mode, the device plays the final part of the Programming melody.

In case of manual programming the Master Key, for all succeeding User Keys the default status is automatically set as enabling arming and disarming of all the ten alarm loops of the module.

5.6.2. When UPROG.EXE is used to program keys, several Master Keys can be enrolled in the Signal-10 memory. These keys can have different status for succeeding programming of User Keys.

In this case, when a Master Key is programmed all other key codes in the non-volatile memory of the Signal-10 remain unchanged.

5.7. Programming User Keys

The mode of programming User Keys is intended for personnel conducting the affairs at the protected object. A new User Key can be programmed and the authorities of the existing keys can be changed by one of the following ways:

- Manually;
- By means of UPROG.EXE.

5.7.1. To enter the mode of manual programming of User Keys touch the reader connected to the Signal-10 with a Master Key. If the Master Key is recognized then the unit enters the programming mode playing a melody, READY indicator and the reader LED starting flashing.

In this mode the following operations are available:

- Adding new User Keys;
- Changing authorities of existing User Keys.

The Signal-10 exits this mode after expiring one of the timeouts:

- 30 s since programming a last key or since last change of the current status of the key;
- 10 s since proceeding to the programming mode if no key has been presented to the reader and no key status has been changed within this time.

On exiting the programming mode the unit plays a melody.

5.7.2. Each User Key can group any number of the alarm loops. The key can be authorized to operate each alarm loop included in the group by one of the following ways:

- To arm and to disarm;
- To arm only;
- To disarm only.

An alarm loop doesn’t fall under the group if the key have no rights listed above relative to this alarm loop.

A collection of key rights for all alarm loops of the group is called *Key Status*. When the unit is switched to the mode of programming keys the current status is read from the presented Master Key and becomes a default status. A Key Status is indicated by alarm loop indicators as shown in Table 5.8.

Table 5.8. Indicating Status of a Key by Signal-10 Loop Indicators

Key's Authorities	Performance of the related LED
Arm/Disarm	Flashes with green and red alternately
Arm Only	Flashes with red
Disarm Only	Flashes with green
None	Flashes with amber / Off

To assign other rights for a key, start a manual right settings procedure by pressing the tamper switch down for a long time. After the tamper switch is released the frequency of flashing of LED «1» is doubled specifying the alarm loop due to which the rights of the key can be changed. Short presses on the tamper switch successively change the rights of the key relatively to the alarm loop. LED flashing in amber means that the alarm loop is excluded from the group of the alarm loops operated by the key.

Proceeding to the next loop is fulfilled by a long press on the Signal-10 tamper switch. Alarm loops are selected successively and cyclically: after the alarm loop 10 a long press selects the alarm loop 1 again.

Once the status of the current key is configured, present the key to a reader in order to write the code of the key and its modified control rights to the device non-volatile memory.

5.7.3. If UPROG.EXE software utility is in use, a set number of Use Keys can be written in the unit's memory, each key having an individual status. Codes and authorities of the keys stored in the Signal-10 memory remain unchanged.

5.8. Maintenance

While maintaining the Signal-10 follow your applicable local standards, codes, regulations, and ordinances.

5.8.1. The procedures below are intended for inspecting operability of the device on receipt and while operating within the protected premises. The maintenance activities are to be performed at least annually by competent specialists with a relevant electrical safety qualification level.

5.8.2. The Signal-10 should be tested under the following ambient conditions:

– Ambient temperature: 25 ±10 °C;
– Relative Humidity: 45 - 80 %;
– Atmospheric pressure: 630 - 800 mm Hg, 84 – 106.7 kPa.

5.8.3. The connection diagram for testing operability of the Signal-10 is shown in Appendix C. The inspection of a single unit takes no more than 10 minutes.

Please power off the Signal-10 prior to connecting and disconnecting wires.

Inspect the Signal-10 operability by doing the following:

а) Apply power to the Signal-10;
б) The built-in sounder shall play the Starting signal;
в) Ensure that the current consumed by the Signal-10 doesn't exceed the values specified in Section 2.8;
г) Verify the S2000M panel displays the events of connecting the Signal-10 and resetting the Signal-10.

5.8.4. Testing the Signal-10 in Indication Test Mode.

In the Indication Test mode operability of LEDs and the sounder is inspected. The test is started from the S2000M panel menu (refer to the S2000M User's Manual to get more information).

As soon as the Indication Test mode has been started:

– The panel sounder plays a melody;
– The LEDs "1" to "10" illuminate with red within 3 s.

Then the LEDs turn off and then begin flashing one-by-one starting with «1» with green and red alternately for 1 s each. At the same time the Signal-10 activates its built-in sounder in Fire Alarm mode.

After completing the test the Signal-10 automatically exits the Indication Test mode and returns to the quiescent mode.

5.8.5. Testing the Signal-10 in Self-Diagnostic Mode.

In Self-Diagnostic Mode the Signal-10 checks operation of its light indicators, sounder, and outputs.

WARNING

Before testing the Signal-10 in Self-Diagnostic mode detach its outputs from the executive circuits if activation of executive devices is inadmissible during inspection

To switch the Signal-10 to the Self-Diagnostic mode press and hold its tamper switch pressed three times for a short time (0.1 s to 0.5 s) and once for a long time (1.5 s and longer). The pauses between presses should be 0.2 s to 1 s.

If the press combination is correct the Signal-10 switches to Self-Diagnostic mode:

- The unit's sounder plays a melody;
- READY LED starts flashing with red twice per second;
- LEDs «1» to «10» show solid red light within 3 s; then
- LEDs «1» to «10» one-by-one flash with red and green alternately for 1 s. At this time the Signal-10 outputs from 1 to 4 switch on one-by-one in 2 s;

The last output, LMP having switched off, the Signal-10 automatically exits Self-Diagnostic mode and returns to Operation mode.

5.8.6. Inspecting the Alarm Loops

1) Disconnect the first alarm loop (disconnect the termination resistor) and measure the voltage across the alarm input contacts. Ensure that the voltage value is within the range of 26.5 V to 27.5 V.
2) Connect the 4.7 K resistor to the first alarm loop and read the ATD value for the alarm loop 1 with the help of the S2000M panel by doing the following:
   - Select REQUEST INFO / ZONE ADC command in the control menu of the S2000M;
   - Enter the network address of the Signal-10 (the factory value of the address is 127) or select the relevant descriptor in the list of connected devices by means of ◄ and ► panel buttons;
   - Enter the loop number – «1».

   A value displayed by the S2000M must be within a range of 46…50.
3) Repeat the step 2) for other alarm loops from AL2 to AL10.

5.8.7. Annual maintenance activities involve:

а) Inspecting the Signal-10 enclosure for mechanical damage, verifying for secure mounting and tightening connections;

б) Clearing the contacts and Signal-10 enclosure from dust, debris, and corrosion;

в) Inspecting operability of the unit as described in Section 5.8.5 of this manual.

6 Storage

6.1. There must not be any acid fumes, alkaline fumes and other aggressive gases and harmful impurities which can cause corrosion in the premises where the Signal-10 is stored.

7 Certificates

Conformity Certificate C-RU.ПБ01.В.02788 certifies that the Signal-10 Intrusion and Fire Alarm Control Unit meets the requirements of Federal Law of the Russian Federation of July 22, 2008 No.123-FZ.

Conformity Declaration ТС № RU Д-RU.МЕ61.В.00317 certifies that the Signal-10 Intrusion and Fire Alarm Control Unit meets the requirements of Technical Reglament of Custom Union TR CU 020/2011

Conformity Certificate No. BY/112 02.01.033 00251 is issued by Republican Centre for Certification and Expertise of Licensable Activities Of Ministry for Emergency Situations of the Republic of Belarus, 73a Zakharova Str., Minsk, 220088

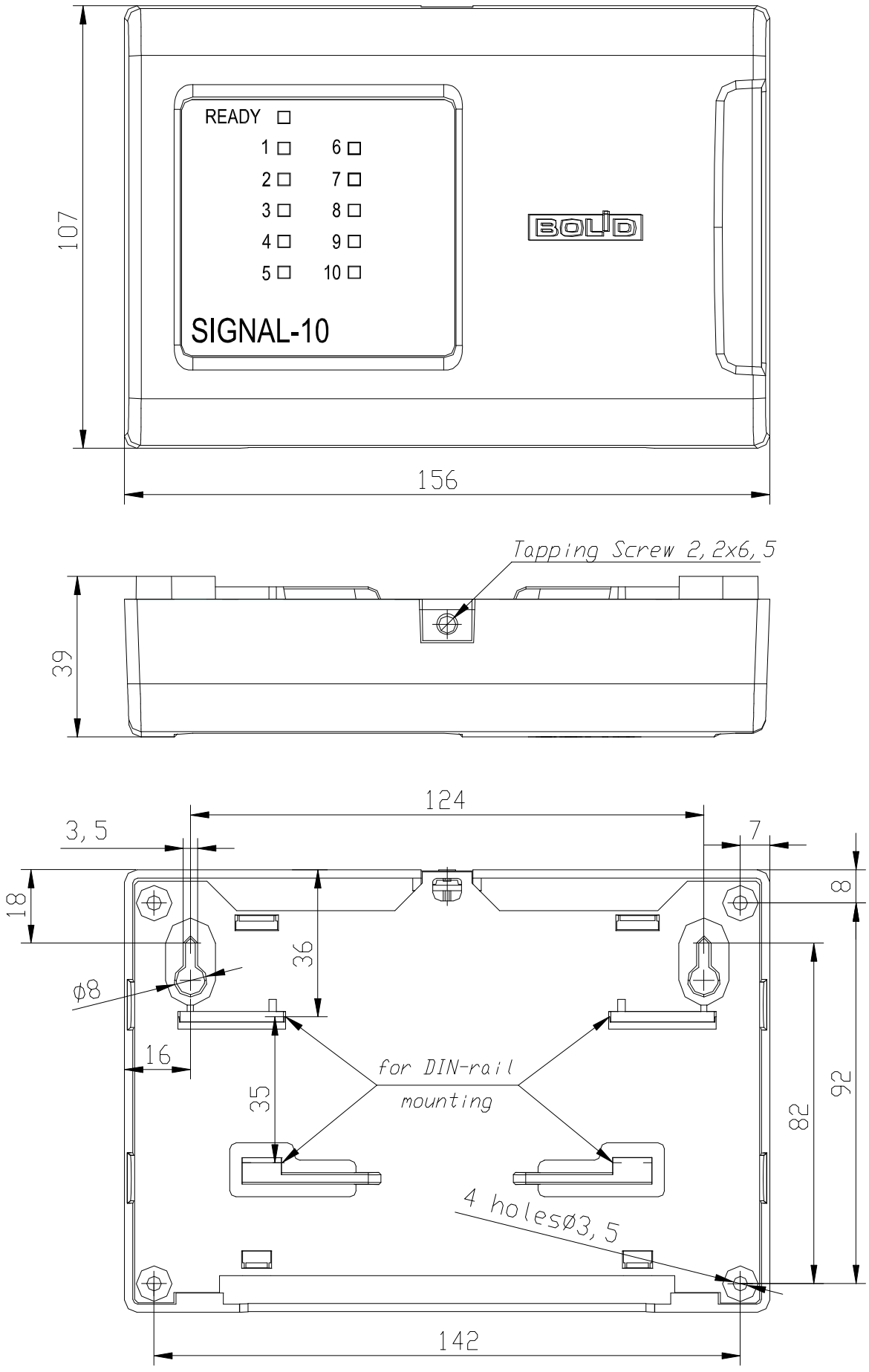
Conformity Certificate No. BY/112 03.11.023 01286 is ssued by Center for Certification of Technical Equipment of Security and Fire Alarm Systems of the Department for Safety and Security of MIA of the Republic of Belarus, 7a Grushevskaya St., Minsk, 220036

Conformity Certificate No. РОСС RU.ИК32.К00153 **ИСО 9001**

ZAO NVP Bolid, 4 Pionerskaya Str., Korolev 141070, Moscow Region, Russia
Phone/fax: +7 495 775-7155
Email: info@bolid.ru
Technical Support: support@bolid.ru
http://bolid.ru

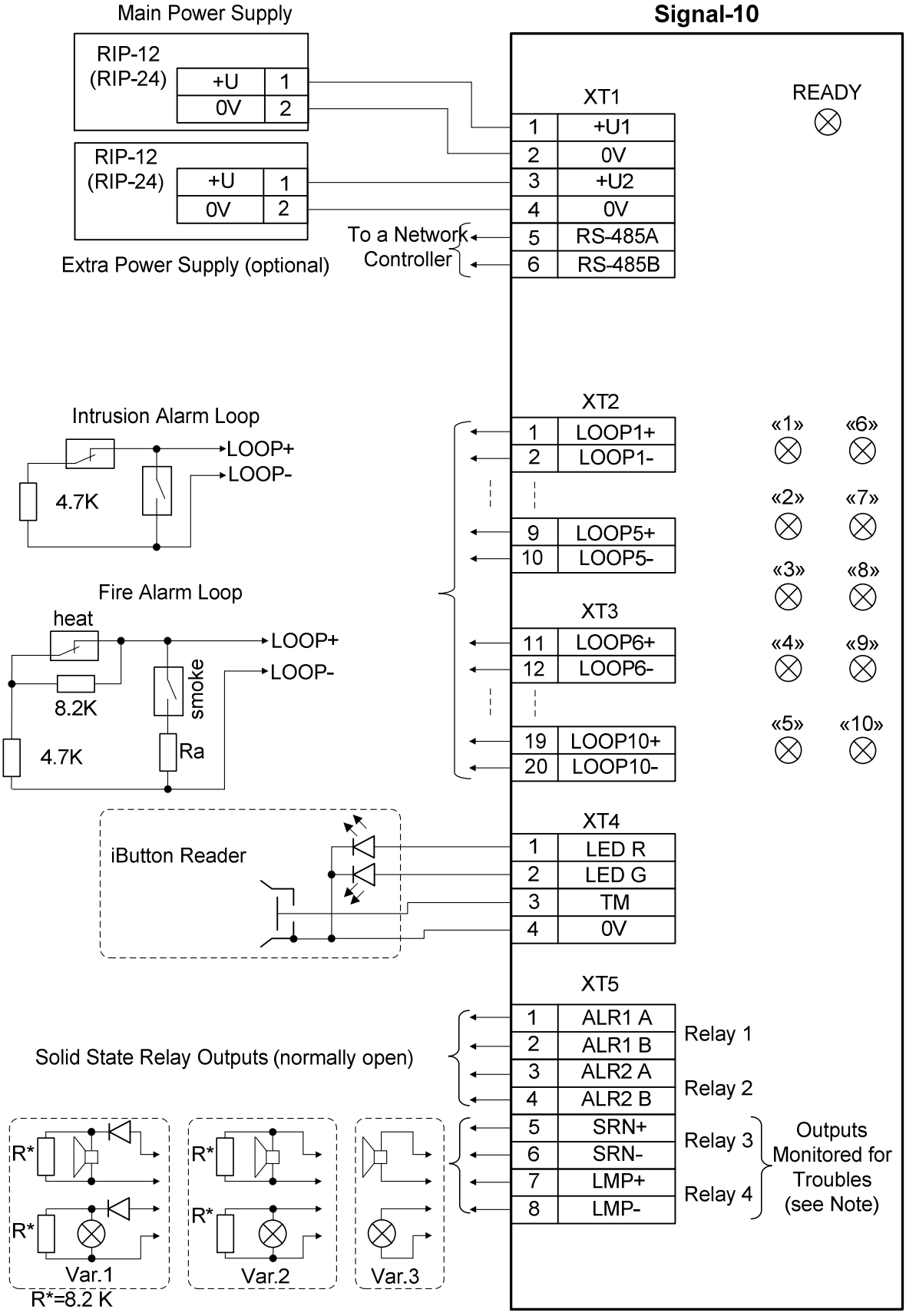
Appendix A

View



Appendix B

Operation Connection Diagram



Note: Following are the variants of connecting notification appliances to LMP and SRN outputs.

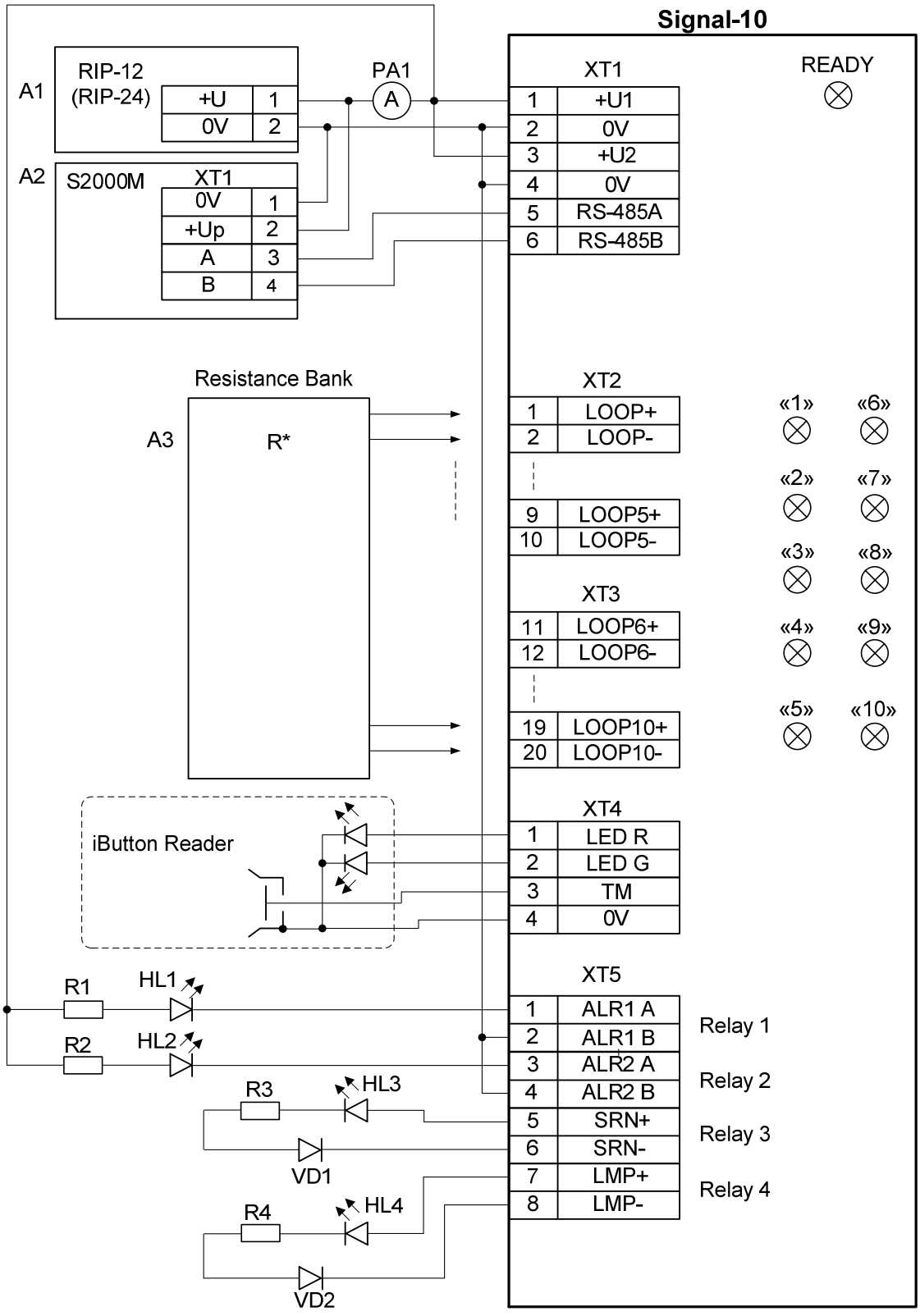
Variant 1: is for sound and light alarms with high internal resistance (more than 10 K) and low operating current (less than 2.5 mA) such as piezoelectric sirens and single light electric diodes.

Variant 2 is for sound and light alarms with high internal resistance (more than 10 K) such as LED displays.

Variant 3: is for sound and light alarms which internal resistance from 26 Ω to 10 K.

Appendix C

Wiring the Signal-10 for Operability Inspection

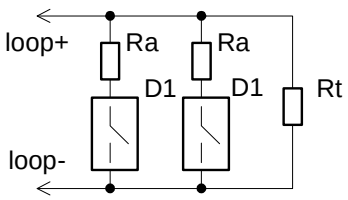


A1: A power supply 12 V dc (24 V dc), 2 A;
A2: An S2000M panel;
A3: A resistor bank;
PA1: A milliampermeter;
HL1…HL4: Single LEDs;
R1...R4: Resistors 1/4W – 2kΩ;
VD1, VD2: 1N4007 diodes

Appendix D

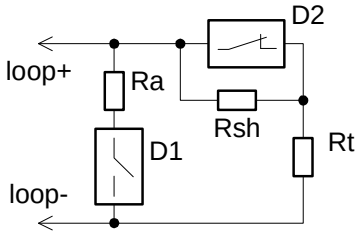
The Schematics for Wiring Detectors into Alarm Loops

Type 1 (Smoke Two Threshold Alarm Loop)



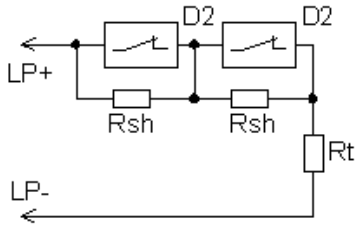
Ra: An additional resistance of 1.5 ÷ 3 kΩ;
Rt: 4.7 kΩ;
D1: A smoke detector

Type 2 (Combined Fire Alarm Loop)



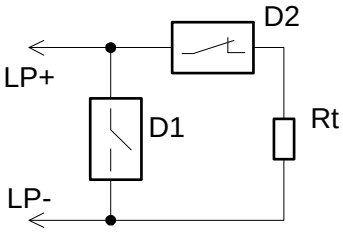
D1: A smoke detector;
D2: A heat detector;
Ra: 0 ÷ 512 Ω;
Rsh: 8.2 kΩ;
Rt: 4.7 kΩ

Type 3 (Heat Two Threshold Alarm Loop)



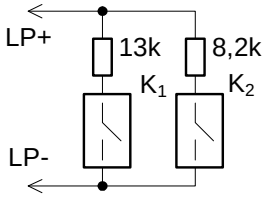
D2: A heat fire detector;
Rsh: 4.7 kΩ;
Rt: 4.7 kΩ

Type 4 (Intrusion Alarm Loop)



D1: A normally open intruder detector;
D2: A normally closed intruder detector;
Rt: 4.7 kΩ

Type 5 (Intrusion with Tamper Monitoring)

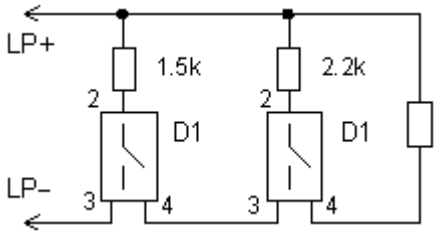


K1: The tamper switch contact;
K2: The detector contact

Appendix D

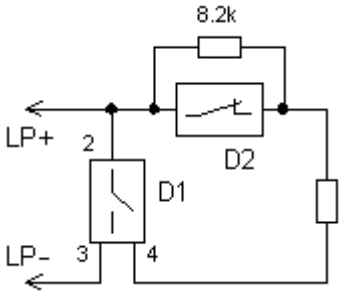
(Continued)

Connecting Smoke Detectors into Alarm Loops of Type 1

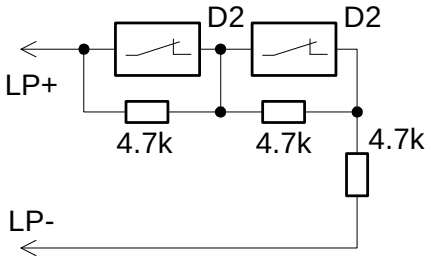


D1: A smoke fire detector

Connecting Smoke and Heat Detectors into Alarm Loops of Type 2

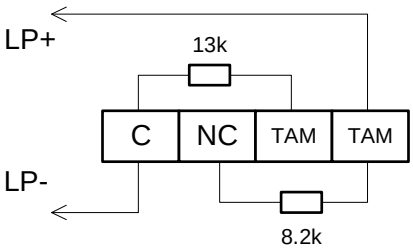


Including Heat Detectors into Alarm Loops of Type 3



D2: A heat fire detector

Wiring a Foton-SK Intrusion Detector into Alarm Loops of Type 5



Connecting IPR 513-3 Manual Call Points