

Controller Z-5R (Relay Version)

1. GENERAL INFORMATION

The Z-5R (Relay Version) controller, or the Z-5R (Relay Case Version) in a plastic enclosure - hereinafter referred to as the controller - is designed for use in access control systems (ACS) as a standalone controller with a power relay output for controlling external devices. A Dallas Touch Memory contact key reader (for DS1990A keys), or a contactless proximity card reader emulating the iButton (Dallas Touch Memory) protocol, may be used as the input device.

The following equipment can be connected to the controller:

- external proximity card reader transmitting data over the iButton protocol, or a Dallas Touch Memory contact key reader;
- electromagnetic or electromechanical lock;
- normally-open door release button;
- external LED;
- external buzzer;
- door position sensor.

2. TECHNICAL SPECIFICATIONS

External reader interface	iButton (Dallas Touch Memory)
Maximum number of keys/cards	1,364
DS1996L key support	Yes
Audible/visual indication	Buzzer, LED
External LED and buzzer control	Yes
Lock control output	1 Form C (SPDT) relay
Switching current at 24 V DC / 120 V AC	3 A
Jumper-selectable initial relay state	On/Off
Lock release time	0 to 220 s
Factory-set lock release time	3 s
DC supply voltage	8 to 18 V
Maximum current consumption	45 mA
Enclosure dimensions	65 x 65 x 20 mm
PCB dimensions	40 x 36 x 15 mm
Enclosure material (Relay Case Version)	ABS plastic
Enclosure with PCB, mass	53 g
PCB, mass	26 g

Use twisted-pair cable, such as UTP CAT5, to connect the reader (or contact key reader) to the controller and reduce electromagnetic interference.

For an iButton connection, use one conductor of a twisted pair to connect the GND terminals of the controller and reader. Use the other conductor of the same pair for the signal, connecting the reader output to the controller TM terminal (see Figures 4 and 5).

Reader power may be supplied over a single conductor. If unused conductors remain in the cable, use them to interconnect the reader and controller GND terminals.

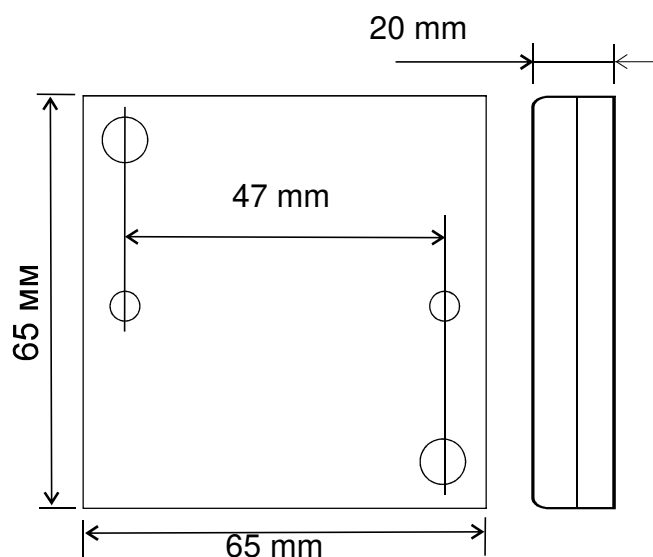


Figure 1. Controller enclosure dimensions.

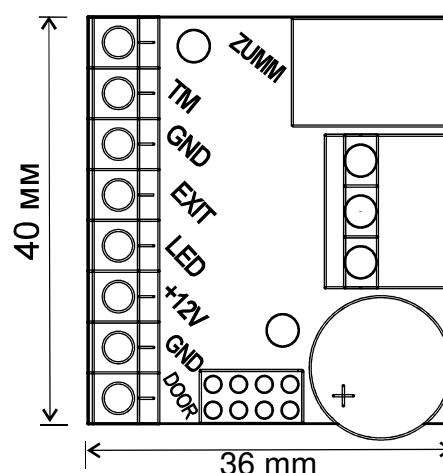


Figure 2. Controller PCB layout.

Table 1. Terminal assignments

No.	Terminal	Function
1	ZUMM	External buzzer connection. Use a 12 V buzzer with an integral oscillator and current consumption not exceeding 50 mA. Connect its positive lead to +12V and its negative lead to this terminal.
2	TM	External reader or contact key reader.
3	GND	Signal ground for the common wires of an external reader, contact key reader, door position sensor, or door release button.
4	EXIT	Door release button. Closing the contact releases the door. Twisted-pair wiring is recommended.
5	LED	External LED. The output current is limited to 20 mA, so the LED can be connected without a resistor. Connect the positive LED lead here and the negative lead to GND.
6	+12V	+12 V controller power-supply positive terminal.
7	GND	Power-supply negative terminal and sensor ground.
8	DOOR	Door position sensor input. Twisted-pair wiring is recommended. When the sensor detects an open door, the controller can stop the audible indication early and conserve energy by switching off an electromechanical lock immediately after the door opens, or by energizing an electromagnetic lock only after the door has closed.

3. CONTROLLER OPERATING FEATURES

1. The controller supports both contact identifiers - DS1990A keys - and contactless identifiers of various standards, such as cards. To use DS1990A keys, connect a contact key reader. To use cards, connect a reader compatible with the applicable card standard (EM-Marine, MIFARE, etc.). The card reader must transmit the code to the controller over the iButton protocol by emulating a DS1990A key. Because contactless systems have largely replaced contact systems, controller operation is described below using a Matrix-II reader connected over iButton; operation with a contact key reader is essentially the same.

2. ACS operation is determined by whether the read card number is present in controller memory and by the status assigned to the card when it was stored. The term "key" is also commonly used for a card number.

Accordingly, the terms "card" and "key" used in this manual (for example, "present the card" or "present the key") are equivalent. The list of cards (keys) and their assigned statuses is the ACS database.

3. Each new proximity card used with the Z-5R (Relay Version) controller must be assigned a status defining the cardholder's permissions. The status is assigned in programming mode the first time the card is presented to the connected reader. To change a card status, first delete the card from controller memory, then store it again with the required status. A Master card can be deleted only by erasing or rewriting all controller memory, which erases the ACS database.

Available card statuses:

- **Master card** - used only to program the controller; it is not used for access;
- **Normal card (access card)** - used to pass through the access point;
- **Blocking card** - used to pass through the access point, including in Blocking Mode, and to enable or disable Blocking Mode.

Blocking cards release the lock when the card is removed from the reader field.

4. Controller memory is empty when the unit leaves the factory. Before the controller can be operated, store at least one Master card, which will subsequently be used to program the device. The card programming procedure is described below.

ACS operating modes for the Z-5R (Relay Version):

- **Normal Mode** - access is granted to Normal and Blocking cards;
- **Blocking Mode** - access is granted to Blocking cards and denied to Normal cards. A Blocking card enables and disables the mode. This is useful when access to a room must be temporarily restricted to a limited group;
- **Accept Mode** - access is granted to Normal cards, Blocking cards, and all new cards. Every new card is automatically stored with Normal status, allowing the controller to build a new database over time;
- **Trigger Mode** - implements the behavior of a conventional latching lock. Each card presentation toggles the relay to the opposite stable state. One short beep sounds when the relay is switched on; four short beeps sound when it is switched off. This mode is intended for electromagnetic locks, although other locking devices may be used. Devices not rated for continuous energization, including many electromechanical locks, may be damaged in this mode.

Single-door standalone ACS configurations:

A. Entry by EM-Marine card and exit by door release button (see Figure 4):

- Matrix-II (E version) reader at the entry side;
- door release button, power supply, and an electromagnetic lock or electromechanical lock/latch at the exit side.

B. If EM-Marine card access is required in both directions, connect the indoor exit reader in parallel to the same terminals as the outdoor entry reader. In this configuration, the exit button may be omitted.

Visual and audible indication of Z-5R (Relay Version) operation

When a card is presented to the reader connected to the controller, one of the following occurs:

- **Card is in the controller database:** the green LED flashes, the buzzer sounds, and the lock is released for the programmed release time or until the door position sensor is activated;
- **Card is not in the controller database:** the green LED flashes twice and two short beeps sound.

4. CONTROLLER PROGRAMMING

Important! Before programming the controller, connect a contact key reader or a reader that supports the iButton protocol.

In the programming procedures below, "present the card to the reader" means bringing the card within the stable reading distance of the reader connected to the controller (up to 2 cm).

Initial power-up of the Z-5R (Relay Version) controller (no keys in the controller database)

After power is applied, short beeps sound for 16 seconds. This indicates that controller memory is empty and Add Master Cards Mode is active.

While the beeps are sounding, present a card to the reader. Its number will be stored as a Master card (Master key). The short beeps stop, confirming that the first Master card has been stored successfully.

To add further Master cards, present them one at a time, with no more than 16 seconds between presentations. The controller confirms each new card with one short beep. Add Master Cards Mode ends automatically 16 seconds after the last card presentation; four short beeps confirm exit from the mode. Master cards are used for all subsequent programming.

If no card was stored, repeat the power-up procedure. Whenever the controller database contains no Normal, Blocking, or Master cards, Add Master Cards Mode starts automatically at power-up.

If all Master cards are lost, controller memory must be erased before a new Master card can be stored. The existing key database will be lost. Controller memory can be backed up and later restored using a Z-1 (N Z version) reader and the free BaseZ5R software.

Table 2. Programming modes

Mode	Activation	Notation
Programming with a Master card		
1. Add Normal and Blocking cards	1LM	1-5: number of presentations
2. Add Master cards	1SM, 1LM	L: long presentation
3. Erase individual Normal and Blocking cards	2SM, 1LM	hold card for about 6 s
4. Erase all cards from controller memory	3SM, 1LM	S: short presentation
5. Set lock release time	4SM	present card for less than 1 s
6. Enter Blocking Mode	1LB	M: Master card
7. Enter Accept Mode	5SM	N: Normal card
8. Save controller memory to a DS1996L key	1SM, 1LM	B: Blocking card
9. Load keys from DS1996L into controller memory	During initial power-up	
Programming with jumpers		
1. Initial relay state: OFF	Position 1	Do not install the jumper
2. Erase memory	Position 2	in any unspecified position;
3. Add Normal cards without a Master card	Position 3	improper operation may result.
4. Initial relay state: ON	Position 4	
5. Enter Trigger Mode	Position 5	

* No jumper installed is equivalent to the jumper being in Position 4.

General properties of programming modes

Short (less than 1 second) and long (about 6 seconds) presentations of a Master card to the connected reader are used to select the required programming mode. After the last card presentation, actions in programming mode must be completed within about 16 seconds. The controller then returns to its initial state and signals the exit with four short beeps.

1. Adding Normal and Blocking cards (1LM)

Present and hold the Master card at the reader (long presentation). The controller emits one short beep when the card is recognized and, after 6 seconds, a second beep indicating entry into Add Normal and Blocking Cards Mode. Remove the Master card.

Present new cards one at a time, with less than 16 seconds between presentations. For each new card, the controller emits one short beep confirming that the card number has been stored with Normal status.

If a presented card is held at the reader for about 9 seconds, one long beep indicates that its status has changed to Blocking. If the card is already in controller memory, two short beeps sound. The mode ends automatically 16 seconds after the last presentation or when a Master card is presented. Four short beeps confirm exit.

2. Adding Master cards (1SM, 1LM)

Briefly present the Master card (short presentation). One short beep confirms recognition. Within 6 seconds, present and hold the same Master card (long presentation). Two short beeps confirm the second presentation; after 6 seconds, one beep indicates entry into Add Master Cards Mode. Remove the Master card.

To add new Master cards, present them one at a time, with no more than 16 seconds between presentations. The controller confirms each new card with one short beep. If the card is already stored as a Master card, no beep sounds. Add Master Cards Mode ends automatically 16 seconds after the last presentation. Four short beeps confirm exit.

3. Erasing individual Normal and Blocking cards with a Master card (2SM, 1LM)

Briefly present the Master card twice. The controller emits one short beep on the first presentation and two short beeps on the second, confirming the presentation sequence in programming mode. Within 6 seconds, present and hold the Master card. Three short beeps confirm the third presentation; after 6 seconds, one beep indicates entry into Erase Normal Cards Mode.

Remove the Master card. Present the Normal and Blocking cards to be erased one at a time, with no more than 16 seconds between presentations. One short beep confirms that a card has been erased. If the card is not in memory, two short beeps sound. The mode ends automatically 16 seconds after the last presentation or when a Master card is presented. Four short beeps confirm exit.

4. Erasing controller memory with a Master card (3SM, 1LM)

Briefly present the Master card three times. The controller emits one, two, and then three short beeps to confirm the first, second, and third presentations. Within 6 seconds after the third presentation, present and hold the Master card.

On the fourth presentation, the controller emits four short beeps. After 6 seconds, a series of short beeps indicates that controller memory has been erased and programming mode has ended. Remove the Master card. Programming mode will start automatically at the next power-up.

*** Erasing the entire database with a Master card does not erase the programmed lock release time.**

5. Programming the lock release time (4SM)

Briefly present the Master card four times. The controller confirms each presentation with a corresponding number of beeps. After four beeps on the fourth presentation, the controller enters Lock Release Time Programming Mode. Within 6 seconds, press and hold the door release button for the required lock release duration.

When the button is released, the controller emits a series of short beeps, stores the duration, and exits programming mode.

6. Blocking Mode (1LB)

In Blocking Mode, access is granted to Blocking cards and denied to Normal cards. Blocking Mode is controlled by Blocking cards (for adding Blocking cards, see Item 2).

A Blocking card can be used:

- as a Normal access card in Normal Mode, when access is granted to all Normal and Blocking cards stored in controller memory;
- to enter Blocking Mode, in which access is granted only to Blocking cards;
- to return from Blocking Mode to Normal Mode.

The controller releases the door when the Blocking card is removed from the reader field.

To enter Blocking Mode, hold a Blocking card at the reader for about 3 seconds until a long continuous beep sounds. If a Normal card is presented while Blocking Mode is active, access is denied and the controller emits a series of short beeps.

To leave Blocking Mode and return to Normal Mode:

- hold a Blocking card at the reader, as when entering Blocking Mode, until a series of short beeps sounds; or
- briefly present a Master card, until a series of short beeps sounds.

*** Blocking Mode remains active after a power failure and subsequent restoration of power.**

7. Enabling Accept Mode (5SM)

Accept Mode stores every card presented to the reader in controller memory with Normal status. The presented card releases the door and is simultaneously recorded as a Normal card. This mode can restore a user database without collecting all users' cards.

To enable the mode, briefly present a Master card five times. The controller confirms each presentation with the corresponding number of beeps. On the fifth presentation, five beeps sound; after 6 seconds, one long beep confirms entry into Accept Mode. To exit, present the Master card. A series of short beeps confirms exit.

*** Accept Mode remains active after a power failure and subsequent restoration of power.**

8. Saving controller memory to a DS1996L key (1SM, 1LM)

To save controller memory to a DS1996L key, connect an iButton (Dallas Touch Memory) contact key reader (see Figure 5). Before starting, erase and initialize the DS1996L key using BaseZ5R software.

Use a Master card to enter Add Master Cards Mode (see Item 3). Briefly present the Master card. One short beep confirms recognition. Within 6 seconds, present and hold the Master card. Two short beeps confirm the second presentation; after 6 seconds, one beep indicates entry into Add Master Cards Mode. Then place the DS1996L key on the contact key reader and hold it there until a series of short beeps sounds. The key database stored in controller memory is copied to the DS1996L key. The data can then be transferred from the DS1996L key to a computer using a Z-1 (N Z version) reader.

9. Loading data from a DS1996L key into controller memory

To load data from a DS1996L key into the Z-5R (Relay Version) controller, connect an iButton (Dallas Touch Memory) contact key reader (see Figure 5). A database must already have been written to the DS1996L key, either by backing up controller memory or by using BaseZ5R software.

Before loading the DS1996L data, erase controller memory using either a Master card or the jumper. Switch the power off and on. During initial power-up, place the DS1996L key on the contact key reader and keep it in contact. A series of short beeps indicates that the data has been written to controller memory. Writing 1,364 keys takes no more than 25 seconds.

5. USING THE JUMPERS

The Z-5R (Relay Version) controller is supplied with a jumper used for controller programming. Five jumper positions are provided (see Figure 3).

Positions 1 and 4 - initial relay state: Position 1 is OFF; Position 4 is ON. These positions select the required contact state if controller power is lost when the lock and controller use separate power supplies. Because the controller relay becomes de-energized when power is lost, the locking device will either also be de-energized or remain energized, depending on the selected position.

Position 2, CLR (clear) - erase controller memory. Switch the power off, install the jumper, and switch the power on. A series of short beeps confirms completion. All keys and the programmed door release time are erased; the factory value of 3 seconds is restored.

Position 3, ADD - add Normal and Blocking cards without a Master card. Switch the power off, install the jumper, and switch the power on. After the beep, the controller enters Add Normal Cards Mode. Add Normal cards by brief presentation and Blocking cards by long presentation. A Master card is not required. The controller exits the mode 16 seconds after the last card is presented and emits a series of short beeps.

Position 5 - enable Trigger Mode. Switch the power off, install the jumper, and switch the power on. In this mode, the relay may remain indefinitely in either stable state, ON or OFF. To toggle the state, present a Normal or Blocking card stored in the controller key database.

Attention! The door release button does not operate in Trigger Mode.

When the controller changes from one state to the other, it emits:

- one short beep when changing from "unlocked" to "locked";
- four short beeps when changing from "locked" to "unlocked".

If no jumper is installed, the controller treats this as Position 4; the initial relay state is ON.

Important! To protect the relay contacts from arcing when an inductive load such as an electromagnetic or electromechanical lock is connected, install the supplied flyback diode in parallel with the lock coil (see Figure 6).

Important! The jumper connector can also be used to connect the controller to a computer through a Z-1 (N Z version) reader and the free BaseZ5R software.

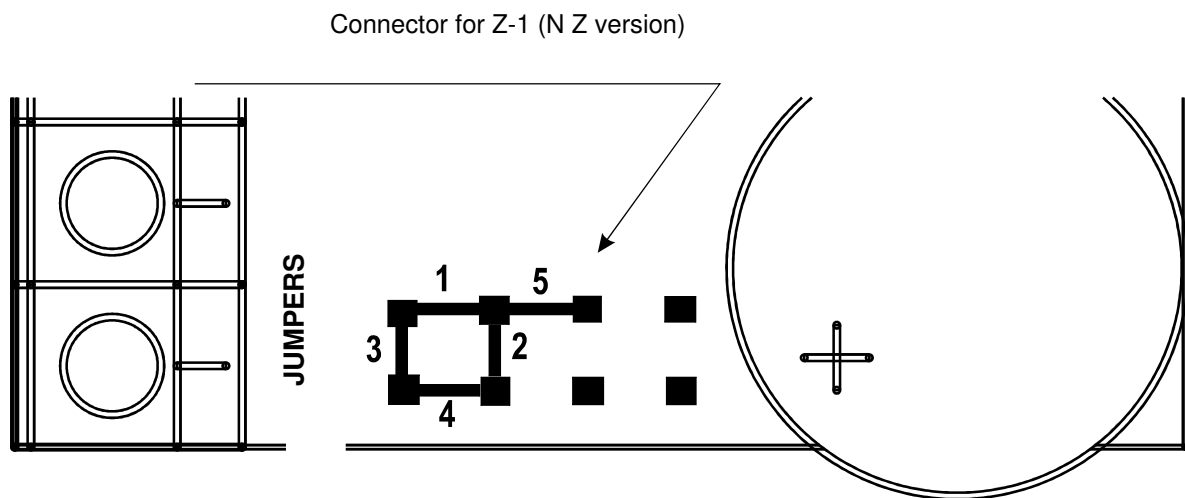


Figure 3. Jumper positions.

6. INSTALLATION AND CONNECTION

To install the Z-5R (Relay Case Version) controller:

1. Open the enclosure.
2. Mark and drill the controller enclosure mounting holes (Figure 1).
3. Wire the connected devices to the controller connector according to the diagram.
4. If an inductive load is used (electromagnetic or electromechanical lock), install the flyback diode shown in Figure 6.
5. When power is applied, the controller enters programming mode (for initial power-up and Master card enrollment, see Section 4).
6. Place the controller in the enclosure, fit the cover, and secure it with the screws.

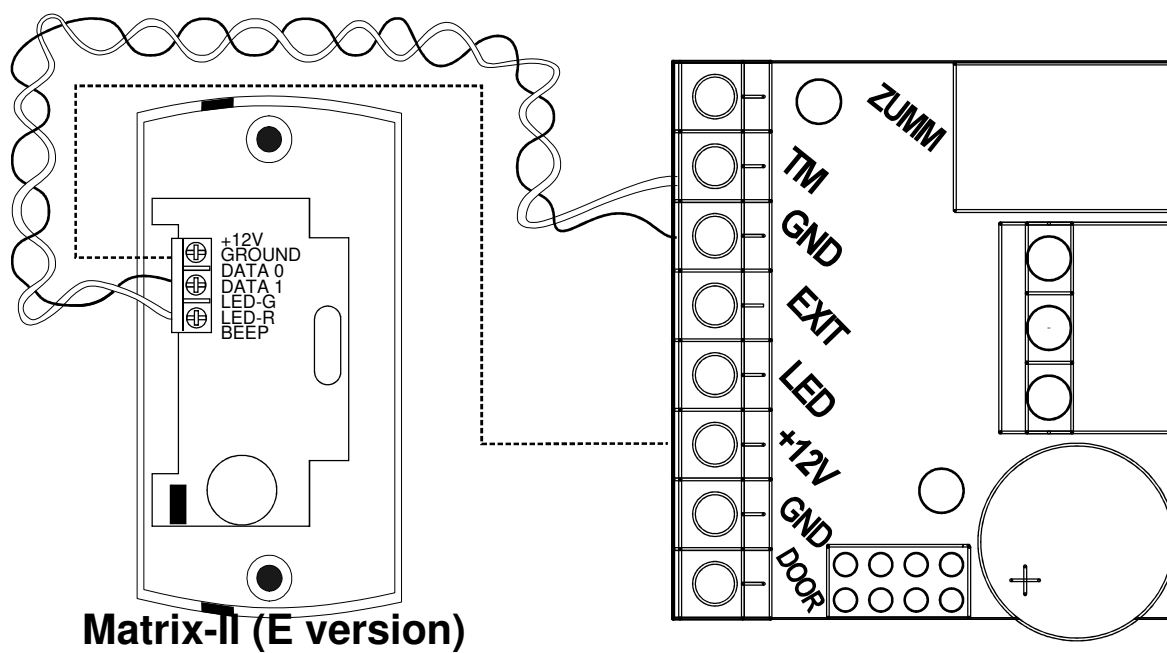


Figure 4. External reader connection.

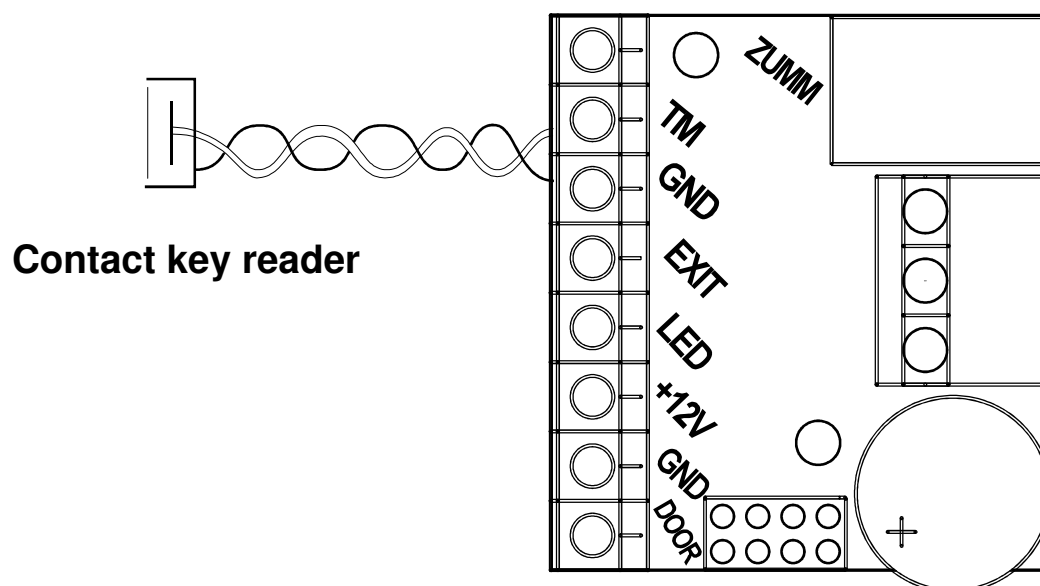


Figure 5. Contact key reader connection.

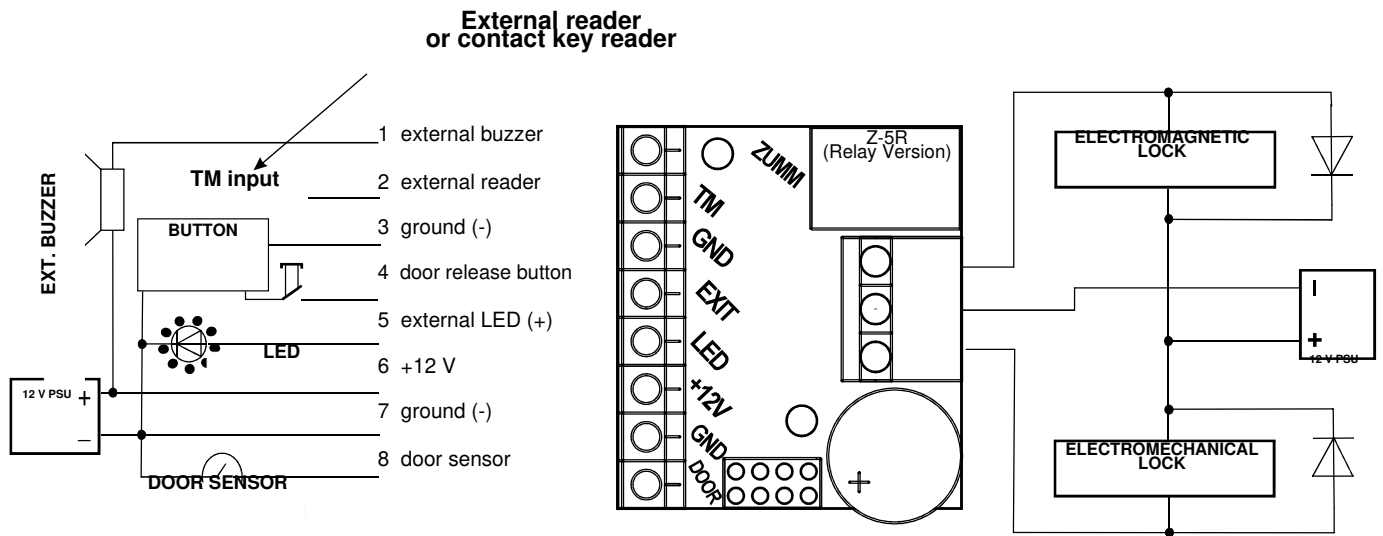


Figure 6. External-device connections.

7. PACKAGE CONTENTS

- Z-5R (Relay Version) or Z-5R (Relay Case Version) controller 1 pc
- 1N5400 flyback diode 1 pc
- jumper 1 pc
- user manual 1 pc
- enclosure for Z-5R (Relay Case Version) 1 pc

8. OPERATING CONDITIONS

Ambient temperature: -40°C to +50°C.

Relative humidity: no more than 98% at 25°C.

If operating conditions change, the technical characteristics may differ from the rated values.

The controller is intended for operation without precipitation, direct sunlight, sand, dust, or moisture condensation.

9. TRANSPORTATION AND STORAGE

The packaged product may be transported in covered vehicles of any type at temperatures from -50°C to +50°C, protected from precipitation, solar radiation, and mechanical damage, in accordance with the freight regulations applicable to the relevant mode of transport and GOST 23088-80. Store the product under Group L conditions in accordance with GOST 15150-69 (temperature +5°C to +40°C; relative humidity up to 80%). Storage life: 5 years.

10. SALE AND DISPOSAL

Sale. The product is sold through ordinary retail channels. The seller does not require a license or special permit to sell this product.

Disposal. End-of-life products must be delivered for environmentally responsible waste recovery. Do not dispose of electronic products with household waste.



12. WARRANTY

The warranty period is 12 months from the date of sale.

Warranty coverage is void in the event of:

- failure to comply with this User Manual;
- mechanical damage;
- evidence of exposure to moisture or aggressive substances;
- evidence of unauthorized work on the device electrical circuitry.

During the warranty period, the Manufacturer will correct defects attributable to the Manufacturer free of charge, or replace defective components and assemblies.

Product service life: 6 years.