CONVERTER
Z397-GUARD
USB – 485

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USER MANUAL

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1. GENERAL

The converter **Z397 Guard** is designed to connect devices with RS-485 interface to personal computer.

Main characteristics:

1) **Galvanic isolation up to 1000V**. Direct connection of different equipment and devices to computer may reduce considerably their characteristics due to impulse interference produced by the computer power supply unit. Conversely, actuating device, connected to PC, may interfere with PC operation. In most cases the galvanic isolation solves this problem.
2) **Connection and power supply by USB**. USB-connection allows solve two problems. The first problem is that many computers, especially notebooks, do not have COM-port, there is no such problem with USB-ports. The number of USB-port may be increased easily. The second problem is connected with a power supply source; power supply from USB-port does not require any additional power sources. It is vital for notebooks used beyond the reach of electric supply network.
3) **Virtual COM-port**. After connection of converter and installation of drivers another COM-port appears in the system. It is called virtual because it cannot be operated directly via registers. This method is usually used for programs written for DOS. Modern programs, operating with Windows, refer to different ports using drivers. From this point of view this port is a fully-featured device. IN other words, the program, operating under the management of Windows, cannot distinguish virtual COM-port from real and shall transmit and receive data in normal mode.
4) **Autodetection of speed**. After turning on and start converter transmits data with the same speed as they come from computer. Thus, any additional settings of speed are not required.
5) **Autodetection of transmit direction.** Converter operates in a **half-duplex** mode and detects automatically the transmit direction. In initial condition it waits for data both from communication channel and computer. In case of simultaneous transmit computer has the priority. Transition from transmit condition to acceptance condition at any speed takes less than 5 microseconds after the transmit of the last stop-bit of the data package. The transmit direction control by RTS will be ignored and has no effect on converter operation.
6) **Connection elements**. Converter has two groups of connection elements.
   - ✓ The first group, near USB is meant to set one of four operating modes. The modes will described below.
   - ✓ The second group, near RS-485, in ON position connects loading resistor 120 Ohm to AB lines. It is required to echo cancellation, if the converter is the last in the network. Usually all the devices, operating with RS-485, may connect this resistor.

Special capabilities

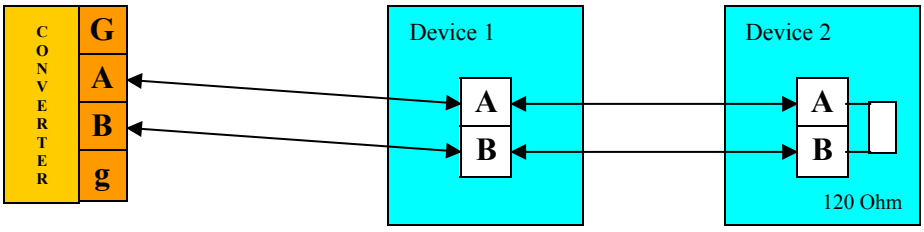
Support of network controllers Z-5R Net and Martix-II Net. In special modes this controller allows to detect and set network addresses listed upwards the controllers using any terminal program. Additionally you may set time of controllers and read events. Besides, this significantly simplifies initial network initialization by means of automatic correction of conflicting network addresses and records of unknown cards by controllers.

2. **Connection of RS-485**

RS-485 interface has been developed on the basis of RS-232 and RS-422. Though RS-422 interface allows connection of several devices, actually it is designed for point-to-point connection. RS-485 allows connecting up to 256 devices at the same line using for communication only one twisted pair. This forces to use a half-duplex mode of communication, i.e. to transmit information only via one devices the other devices only listen. The case when one or more devices transmit data cannot be detected by these devices, as, for example, in case with the interfaces CAN or Ethernet. For this reason all the communication protocols are built by the package principle of transmit with confirmation of received information.

While connection of devices to the interface RS-485 take account for the following:

1) All the devices should be connected in linear configuration, i.e. wires should run from one device to another in turns. Configurations in the form of a star or a tree are inappropriate. But if it is required and the distance is not very large (up to 30 meters), you may try, but you should remember that the interface with this configuration may not operate.
2) **Use twisted pair** for connection. For example, from the 5 category cable the blue wire connect to A, and blue and white wire — to B. If the cable is shielded, it should be connected to G or to g.
3) To provide correct interface operation install two terminal resistors of 120 Ohm at both ends of RS-485 lines. They are required for echo cancellation. This is vital for long ling lines. If converter is installed at the one end, to connect resistor set the connection element No2 in position ON.
4) To connect many devices (бmore than 20), it is recommended to place them with the same distance from each other. You should remember that the length of the line should not exceed 1200 meters.
5) Though the interface may physically and programmatically serve up to 255 devices, it is not recommended to use it at the limit. Thus, if you need long communication line, try to minimize the number of devices or at least place them at the same distance to each other. If there are many devices, try to reduce the total line length.



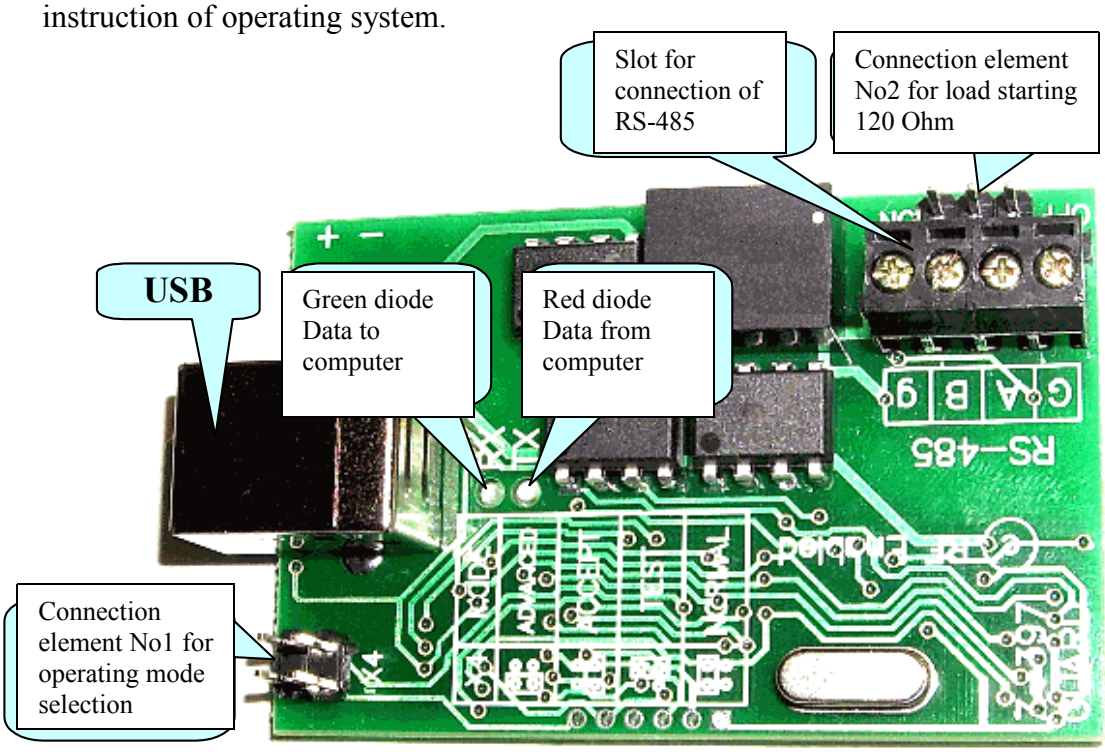
Connection diagram for devices with RS-485 interface.

3. Connection to USB

3.1 Description

This converter is connected to computer via free USB-port by the supplied cable of "AB". Main advantages of this solution:

1) Today almost all computers are equipped with USB-ports. Notebooks often do not have COM-port, but it is difficult to imagine modern computer without USB.
2) USB-ports support hot plugging, i.e. you may turn on and off such devices without switching off the computer.
3) USB-port supply with power the connected device (up to 500 mA). Thus, the power supply unit is not required with the problem of search of free socket.
4) All USB devices support standard Plug-&-Play. Due to this the required drivers will be installed automatically. You only need to insert the disk and follow the instruction of operating system.



3.2 Driver installation

After the first connection of converter to computer, Windows operating system will detect a new device. It takes about 30 cseconds. If within one minute the message about the detection of new devices did not appear, Windows is already familiar with the device and the required drivers have been already installed.

Thus, Windows gave the message about new device. To install drivers insert the supplied disk in CD-drive. Set the mode of driver selection manually and indicate CD-disk where drivers will be installed. After detection of drivers Windows will offer to install them. You should submit. While drivers installation Windows XP will give message on the absence of Microsoft certificate of tested compatibility. In this case continue installation. There will be two such messages because first the driver is installed specially for USB-device and then for virtual COM-port.

3.3 Port search

One of intellectual steps in driver installation is determination of a virtual COM-port number. The logic of distribution of such numbers in Windows was not described anywhere, that is why all the following information is the result of practical experience. Thus, Windows reserves numbers for each new virtual COM-port from COM3 to COM127 and as a limit COM0. The assigned number will be attached to the USB device and will not be assigned to any other devices. Thus, if the computer was connected with devices generating virtual ports, at the moment there are only two standard COM-ports – COM1 and COM2, the new port will not necessarily be COM3.

For precise determination of number when the converter is connected proceed as follows:

1. *Right click the icon "My computer", select the lowest point "Properties" from the menu.*
2. *In the window select the bookmark*

2.1. *for Windows 98/Me – "Devices"*

2.2. *for Windows XP/2000 – «Equipment" and additionally press the button "Device manager"*

3. *Left click the plus opposite the group "Ports (COM and LPT)"*
4. *In the opened group find the number of the device port*.

Attention! Some programs cannot open ports with numbers more than 8. In this case right click to call for contextual menu for this device and select the point "Properties". In the widow come to the bookmark "Port Setting", press the button "Advanced" and set required port number.

This number should be indicated in the communication programs operating with the devices. Speed settings are not required. The converter will operated at the speed set by the communication program for the port.

4. Operating modes

The required operating mode shall be selected by replacement of the connection element No1 in one of four positions. Compatibility of position and mode shall be specified at the converter plate.

4.1 Mode of standard converter - "NORMAL"

The mode of standard converter is RS-485. Autodetection of speed and transmit direction. Indication of transmit direction.

4.2. Network test mode - "TEST"

Controller network test mode. This mode of converter allows testing and setting of network on the base of network controllers Z5R-Net and Matrix-II Net.
To operate in this mode open the converter port using any terminal program, for example, HyperTerminal, and set the following communication parameters:

- Speed — 230400;
- Data bit — 8;
- Parity — no;
- Stop bits — 1;
- Flow control — no.

After input of any command press button “Enter”.

Command "Info"

After connection to computer to test the communication give the identification command "I". In case of correct connection the window of the terminal program will display the following information:

```
Z397-Guard converter S/N:00037
Pulsar Ltd. +7(812)703-77-65, +7(495)787-70-66
Copyright 2008 RF Enabled
http://www.ironlogic.ru
build Jan 14 2009  15:55:34
--------------------------------
Current mode - Test
```

Converter will give reply to this command in any mode.

Command "Time"

Allows setting time in controllers.
Examples of commands:
T – request of time
T 12:30:00 - time setting only
T 21-01-09 – date setting only
T 12:30:00 21-01-09 – time and date setting

Time is 0:00:00 0-00-00 Time and Date not setup - time and date were not set
Time is 12:30:00 21-01-09 – date and time
After any command, if and date are set, the timers of all the detected controllers выполняется (see command "Scan") will be synchronized with timers of converters.

Command "Scan"

Allows detection of connected controllers.
Examples of commands:

S – scan the line RS-485

While scanning controller detects controllers, if their network addresses are already known or if they are out of the range 2 - 33, they are reassigned to the first free network address.
Result of the command operation

```
Scan start
Net addr = 4, Serial number = 139, type - Z5R-Net
Net addr = 6, Serial number = 151, type - Z5R-Net - NEW
Net addr = 7, Serial number = 132, type - Matrix-II-Net - REMOVED
```

The additional message "NEW" – indicates that the controller was detected for the first time, and the message "REMOVED" – indicates that the controller has not been detected and will be removed from the list.

Command "Ctrl"

Outputs additional information on detected controllers.
Example of command:
C – output all the detected controllers
C 4 – output information on controller with network address 4

Result of the command

```
Net addr = 4, Serial number = 139, type - Z5R-Net
  Door times (*0.1s): open lock 30, wait open 0, wait close 0
  Timezone1 from 00:00 to 23:59 days-7F
  Timezone2 from 00:00 to 23:59 days-7F
  Timezone3 not active
  Timezone4 not active
  Timezone5 not active
  Timezone6 not active
  Timezone7 not active
  Cards use 11 from 2024
```

Command "Event"

Outputs the list of new events for one or all controllers.
Example of command:
E – output all new events for all detected controllers
E 4 – output all new events for controller with network address 4

Result of the command

```
Ctrl  4 SN(139) Pnt[2480:2480] 0 events.
Ctrl  6 SN(151) Pnt[17A8:17B8] 2 events.
Ctrl  6 EVENT[17A8] 23/02 19:28:51 {00} Door 0. Open by button
Ctrl  6 EVENT[17B0] 23/02 19:28:51 {10} Door 0. Passage was
Ctrl  7 SN(132) Pnt[00D8:00D8] 0 events.
```

Command "Adr"

Enable the change of the controller network address.
As the first parameter indicate a serial number of controller, as the second parameter – the network address. The new address should be within the range of 2-33 and free.
Example of the command
A 139 33 – set the controller S/N 139 network address 33.

Result of the command

```
Controller 139 change net address from 4 to 33.
```

After the command "Scan"

```
Net addr = 6, Serial number = 151, type - Z5R-Net
Net addr = 7, Serial number = 132, type - Matrix-II-Net
Net addr = 33, Serial number = 139, type - Z5R-Net
```

List of commands.

No	Command	Description	Result
1	I(Info)	Request for information on converter	Information on converter and established licenses
2	T(Time)	Request/setting of date and time Allows setting of time and date by different commands	Current date and time will be recorded into controllers while the following events scanning
3	S(Scan)	Scanning RS-485 all addresses beyond the range 2..33 will be reassigned automatically	Information on detected controllers
4	C(Ctrl)	Receipt of information for the specified controller or for all controllers	Additional information on controller
5	E(Event)	Request of information on new events for the specified controller or all controllers	Issue of messages on events
6	A(Adr) ***A SN N*** *SN – serial number* *N – new network address*	Set network address (N = 2..33) new address should be free	Message on successful setting or on failure causes

4.3 Network initialization mode - "ACCEPT"

This mode is meant for quick start of the set network without the software installation at the computer.

In this mode converter regularly scans the network to detect the controllers. It sets network addresses for the detected controllers. Then events are read. After detection in events the attempt of access by unknown card, it records the number of the card into the controller, and after that gives a remote command for a door release. Operation in this mode may be controlled using the terminal program. The connection parameters — analogous to the Test mode:

- Speed — 230400;
- Data bits — 8;
- Parity — no;
- Stop bits — 1;
- Flow control — no.

In this mode all events occurring in controllers will be displayed automatically. You may also set time using the command "Time" (see mode TEST).

```
Scan result {}
Scan result {}
Scan result {2,6,7}
Ctrl  2 EVENT[2488] 23/02 19:28:51 {05} Door 1. Open by key num [1]
Ctrl  2 EVENT[2490] 23/02 19:28:51 {11} Door 1. Passage was
Scan result {2,6,7}
Scan result {2,6,7}
Ctrl  6 EVENT[1548] 23/02 19:28:55 {02} Door 0. Unknown key [1901] 162,32936
Card success added.
Ctrl  6 EVENT[1550] 23/02 19:28:55 {08} Door 0. Open by network
Ctrl  6 EVENT[1558] 23/02 19:28:55 {10} Door 0. Passage was
Scan result {2,6,7}
```

4.4 Software support mode - "ADVANCED"

This mode is meant for converter operation under the management of special software. In this mode converter performs some functions improving software reliability and providing license protection.