

ADAPTER FIRMWARE

Version 1.05

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1. Adapter Features

- The adapter contains a microcontroller, 2 relays, 2 channels of digital input, a translator UART <--> RS485
- Receiving commands from the Main device via RS485 interface and sending replies
- Relay activation for a given time
- Reaction to enable / disable relay operation, received as digital input signal
- Monitoring the presence of communication with the Main device and disconnecting the relay when the connection is lost

2. Milestone

Development. At this stage, the firmware is developed and the operation of the firmware is checked. Since interaction with the Main device is carried out using text commands, a PC with a terminal emulator can act as a response. Text commands are generated by a person on a PC and sent to the adapter. The adapter runs them and sends responses. Responses are accepted on the PC and displayed. As a simulator, you can turn on and off the lamps, as well as buttons for generating digital input signals.

3. Communication protocol

3.1. General information

The protocol is simple, textual. At the end of the text of the command or response is always a separator (zero byte).

First, always a command from the Main device, then a response from the Adapter. If there is no answer, it is considered that the Adapter is not functioning. Timeout time - 1 second (to be specified during the development process). Until the completion of the command response cycle, a new command is not issued.

In turn, the lack of commands from the Main device is perceived by the Adapter as a lack of communication.

3.2. Commands

3.2.1. Turn On Output Channel. This command enables one of the output channels. Text view:

ON xx,ttt

where

xx is the output channel number (from 00 to 99) or ALL (means all channels in the current hardware implementation);

ttt is the turn-on time in seconds (from 001 to 999)

Important notice. In the current implementation, there are only two output channels (relays), so the channel numbers are in the range from 01 to 02.

The adapter responds to this command:

RSP xx,r

where r is the response code:

r = 0 - OK, the beginning of waiting for the physical inclusion of the channel

r = 1 - output channel xx was already physically turned on earlier

r = 2 - output channel xx does not exist

3.2.2. Turn Off Output Channel. This command disables one of the output channels. Text view:

OFF xx

where

xx is the output channel number (from 00 to 99) or ALL (means all channels in the current hardware implementation);

ttt is the turn-on time in seconds (from 001 to 999)

Important notice. In the current implementation, there are only two output channels (relays), so the channel numbers are in the range from 01 to 02.

The adapter responds to this command:

RSP xx,r

where r is the response code:

r = 0 - OK, the output channel for this command is physically disabled

r = 1 - output channel xx was already physically turned off earlier

r = 2 - output channel xx does not exist

3.2.3. Report Adapter Status. This command queries the overall status of the Adapter. Its purpose is to find out if the Adapter is working and whether there is a connection with it. Text view of the command:

ASK

The adapter responds to this command:

SOK vv

where vv is the Adapter firmware version (from 01 to 99).

3.2.4. Report Input Channel Status. This command queries the status of the input channel. Text view:

ADI xx

where xx is the input channel number (from 00 to 99)

The adapter responds to this command:

SDI xx,n

where xx is the input channel number (from 00 to 99), n – input channel number state:

n = 0 – input channel xx off

n = 1 – input channel xx on

n = 2 – input channel xx does not exist

3.2.5. Report Output Channel Status. This command queries the status of the output channel.

Text view:

ADO xx

where xx is the output channel number (from 00 to 99)

The adapter responds to this command:

SDO xx,n

where xx is the output channel number (from 00 to 99), n – input channel number state:

n = 0 – output channel xx off

n = 1 – output channel xx on

n = 2 – output channel xx does not exist

3.2.6. Report Unsaved Output Channel Uptime. This command requests the unsaved operating time of the output channel. Text view:

SRT xx

where xx is the output channel number (from 00 to 99)

The adapter responds to this command:

TIM xx,ttt

where xx is the output channel number (from 00 to 99), ttt – unsaved output channel operating time in seconds (if it is not there, then ttt = 000).

Important notice. In the current implementation, there are only two input channels and two output channels (relays), so the channel numbers are in the range from 01 to 02.

4. Main Device and Adapter Interaction Logic

- 4.1.1. The Main Device periodically (once in K seconds, when designing K = 30, the value of K is specified during the development process) monitors the presence of communication in the Adapter. This is done by the ASK-command and waiting for a response to it. If there is no response, the Main Device informs about this on its screen and until the connection is restored, it does not allow the operator to start the “procedure” at the facility. On the other hand, the adapter also monitors the connection with the Main Device and, if the connection is lost, it turns off the relay, after remembering how long the relays have been working.
- 4.1.2. The main device, in dialogue with the operator, determines the beginning of the “procedure” and sends commands to turn on the relays in the adapter. Since the adapter turns on the relay only after the digital input signal appears, the main device continues to send these relay switching commands to the adapter every second until it receives a response with r = 1. This will happen only after the digital input signal appears.
- 4.1.3. After turning on the relay, the Main Device periodically (once every K seconds, see 4.1.1) requests the status of the relay (output channel) from the Adapter. The configuration allows you to have several relays and you need to request the status of all relays. If the relay (output channel) is turned off (response with n = 0), then the Main Device should request the status of the input channel. The status of the input channel allows the Main Device to find out why the relay turned off:

n = 0 - the input channel is off, which means that the relay (output channel) is turn off due to an external factor

n = 1 - the input channel is turned on, so the relay (output channel) is turned off after the time (ttt) during which it was turned on

4.1.4. At the initial appearance of communication between the Main device and the Adapter, the unsaved operating time of the output channels (relay) is transferred to the Main device. This is done by sending SRT commands from the Main device and receiving an unsaved operating time for each output channel (relay) in response from the Adapter. After transferring unsaved time, its value in the Adapter is reset.