



ELSETA

IOMOD 16DI

User manual

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DECLARATION OF CONFORMITY

(in accordance with ISO / IEC Guide 22 and EN Section 45014)

Manufacturer: UAB Aedilis

Address of the manufacturer L. Zamenhofo st. 5 LT Vilnius, Lithuania

We claim that:

The device IOMOD 16DI

Conforms to the following standards:

EMC:

Radiation EN 55022 (Class A)

1 emitted radiation (30-1000MHz)

Second radiation conductors (0.15-30MHz)

EN 50082-1 immunity test

1 IEC 801-3: Radio-frequency electromagnetic field

2 IEC 801-2: Electrostatic discharge.

3 IEC 801-4: Quick periodic electrostatic discharges

Additional information:

"The device complies with the Low Voltage Directive 73/23 / EEC and EMC Directive 89/336 / EEC.

Device assembly complies with the RoHS Directive.

Manufacturer contact:

Equipment quality controller

UAB Aedilis "

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SAFETY REQUIREMENTS

This equipment Operating notes, which must be met for your personal safety, as well as to avoid damage to the equipment. These notes are marked with a warning triangle symbol and the various degrees of risk of falling within signs. All work related to electronic systems design, installation, commissioning, adjustment and maintenance should be carried out in accordance with the safety requirements.

EQUIPMENT'S MANUAL USES SYMBOLS



Danger - important notice, which may affect the safety of the user or device.



Attention - notice on possible problems that may arise in individual cases.



Information Notice - the information that is useful advice or special places.



Warning of the danger. The work may be performed only by a qualified professional. Equipment installation, commissioning and maintenance may only be performed by a qualified professional. If the safety notes in this manual, the term refers to persons qualified specialists authorized to perform commissioning, grounding and labeling devices, systems and circuits. The person must: Be aware of occupational safety in the workplace. Need to understand the equipment components. Electrical equipment. Have the knowledge and skills to identify a component beneath the voltage.



To maintain the equipment necessary to always turn off the power supply before installing or dismantling works. It must be in mind that even though alone equipment, but can have a common ground connection. Always before connecting the power supply, cables and interconnect components must be inspected.



This product can not be implemented, or resold to install in areas that are high-security as nuclear power plants, aircraft navigation, military equipment, transport traffic in management. In areas where equipment failure can result in of nature and human injury.



Do not operate the equipment in extreme weather conditions, as they may affect the operation of the equipment.

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1. Introduction

IOMOD 16DI is small sized stand-alone Modbus (RTU) or IEC 60870-5-103 digital input controller. IOMOD is used for industrial applications, where digital signaling is used and robust communication is needed. IOMOD is ideal solution for applications such as data acquisition, observation, process monitoring, testing and measurement at remote places. It is controlled over Modbus or IEC 60870-5-103 protocol, and can be used with any SCADA system.

2. Features

- 16 digital inputs with configurable active signal polarity, or input inversion; Pulse count and ON time count
- Galvanically isolated inputs
- Configurable over USB
- Drag And Drop firmware upgrade over USB
- RS485 communication
- LED input indications, + Data transmission (Rx and Tx) indication.
- Small sized case with removable front panel
- DIN rail mount
- Operating temperature: from -30 to +70°C
- Power Requirements: 12-24 VDC

3. Device working information

IOMOD 16DI uses Modbus (RTU) or IEC 60870-5-103 protocol over RS485 interface. Protocol used by device can be changed by uploading corresponding firmware. Default communication settings are: 9600 baudrate, 8N1, Slave address - 1.

a. MODBUS working information

To read all input status, send 02 Modbus command (Read Discrete Inputs) with resolution of first register (0) and size of 16. Returned value will show 16 input states.

To read all input registers, send 04 Modbus command (Read input registers) with resolution of first register (0) and size of 48. Returned data will show pulse count (first register) and ON time (2nd and 3rd registers) for each input – pulse count of input #2 will be at register 4th, and so on. ON time will be shown as seconds. ON time and pulse count will increase when input pulse is longer than Filter time, which is configured by user in USB terminal menu. Shorter pulses will be ignored in both pulse and ON time registers.

To invert input states by software, configure device over USB terminal. Useable Modbus commands shown in table below.

Supported MODBUS functions

02 (0x02) Read Discrete Inputs

Reads status of digital inputs (Off or On). IOMOD 16DI has 16 digital inputs from address 0 to address 15; These inputs are active-high or active-low according to supply given to reference input. User can turn on logical input inversion (through USB).

04 (0x04) Read Input Registers

Reads input count values – pulse count and ON time for each input. IOMOD 16DI has 16 digital inputs from address 0 to address F; 3 registers are used per input to show count values – maximum number of registers is $16 \times 3 = 48$. First register in group shows pulse count (16bit unsigned integer), 2nd and 3rd registers show total ON time of that input (32bit unsigned integer) in seconds.

06 (0x06) Preset Single Register

Sets single register. Register addresses is identical to “Read Input Registers” addresses.

Modbus registers

Function	Register	Name	Description	Values range
02	00000-0000F	<i>Read Discrete Inputs</i>	Returns Input status	0-65535 (decimal)
04	00000-00030	<i>Read Input Registers</i>	Returns input count values	0-65535 (16bit)
06	00000-00030	<i>Preset Single Register</i>	Sets count values	0-65535 (16bit)

Testing With “THE VINCI” software

To test IOMOD with default settings, user connects device through RS485 to Modbus master. Example using “The Vinci Expert” device as serial interface converter and adapter to PC with “The Vinci” software. Default settings for Modbus – 9600 baudrate; 8 data, no parity, 1 stop bit. When opening “The Vinci” software, choose Modbus serial – Master mode. In settings tab, choose station number (default – 1); configure tags (as described in section 2. Device working information); Press start and go to “Statistic” tab:

THE VINCI PROTOCOL ANALYZER

File Tags Options Help

Protocol: MODBUS serial Mode: Master Stop Port A: COM3 Baudrate: 9600 Format: none.3.1

Extra: Set VINCI ports Device manager Swap ports

Settings Console Events Statistic The Vinci Expert

Station	Function	Address	Value	Count	Name
1	Read Discrete Inputs (02)	0	00000000	28	Input S...
1	Read Discrete Inputs (02)	1	00000000	28	-
1	Read Discrete Inputs (02)	2	00000000	27	-
1	Read Discrete Inputs (02)	3	00000000	27	-
1	Read Discrete Inputs (02)	4	00000000	27	-
1	Read Discrete Inputs (02)	5	00000000	27	-
1	Read Discrete Inputs (02)	6	00000000	27	-
1	Read Discrete Inputs (02)	7	00000000	27	-
1	Read Discrete Inputs (02)	8	00000000	28	-
1	Read Discrete Inputs (02)	9	00000000	28	-
1	Read Discrete Inputs (02)	10	00000000	27	-
1	Read Discrete Inputs (02)	11	00000000	27	-
1	Read Discrete Inputs (02)	12	00000000	27	-
1	Read Discrete Inputs (02)	13	00000000	27	-
1	Read Discrete Inputs (02)	14	00000000	27	-
1	Read Discrete Inputs (02)	15	00000000	27	-

Clear

Tags Format

Id	Name
1	Input Status

Add Edit Delete Send Help

Filter Off TX: 58 RX: 58 Error: 0

Fig. 3.1

4. Technical information

System		
1.	Dimensions	101 x 119 x 17.5, mm
2.	Case	ABS, black
3.	Working environment	Indoors
4.	Working temperature	-30 ÷ +70°C
5.	Recommended operating conditions	5 – 60°C and 20 – 80%RH;
6.	Configuration	USB
7.	Firmware upgrade	USB – mass storage device
Electrical specifications		
8.	Inputs	16 X 2kV isolated 12-24VDC; ESD protected; Selectable inversion.
Power		
9.	Power Supply	9V to 33V
10.	Current consumption	100 mA @ 24VDC

5. Mounting and installation guide

a. IOMOD 16DI RS485 interface

IOMOD 16DI has integrated 120Ω termination resistor which can be enabled or disabled over USB configuration. It is recommended to use termination at each end of the RS485 cable. See typical connection diagram on Fig. 5.1.

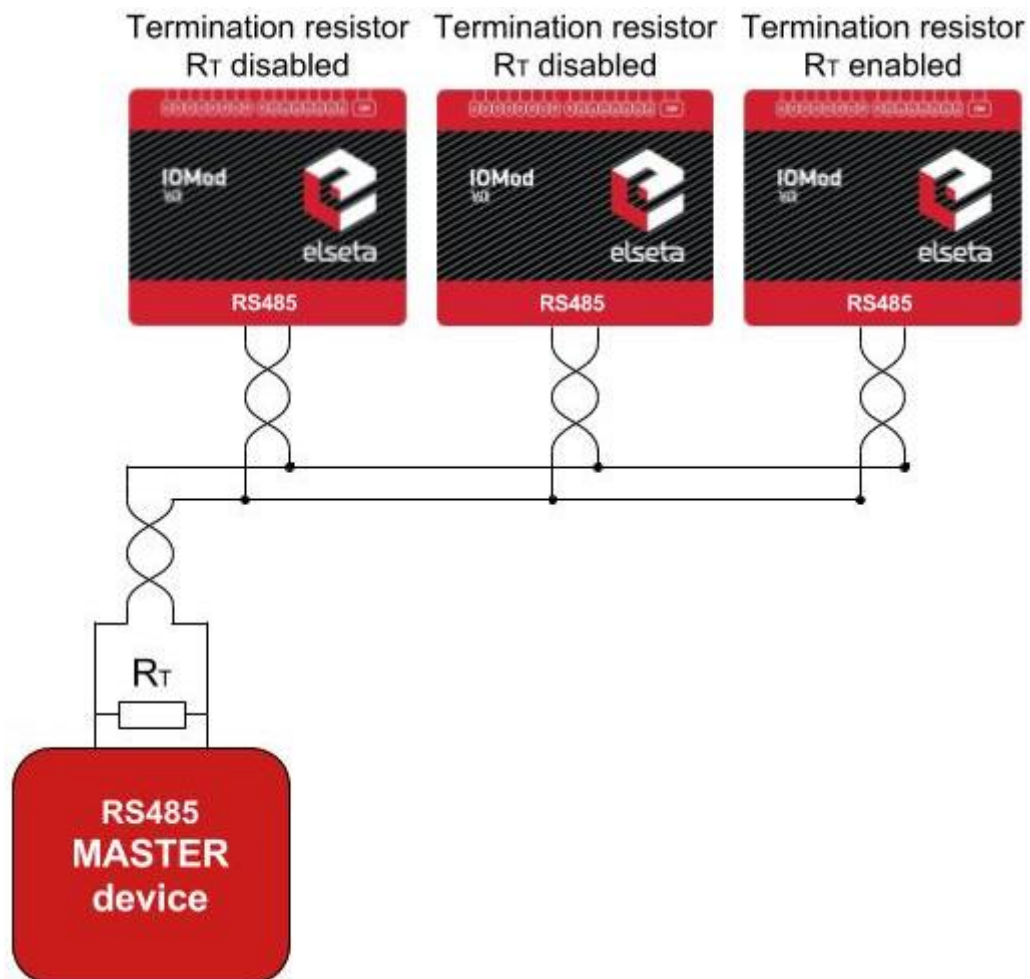


Fig. 5.1

IOMOD 16DI has 1/8 Unit load receiver which allows to have up to 256 units on line (compared to standard 32 units). To reduce reflections, keep the stubs (cable distance from main RS485 bus line) as short as possible when connecting device.

b. IOMOD 16DI inputs

Typical application of IOMOD 16DI inputs is shown on Fig. 5.2. When default configuration for inputs is applied, user will see inputs connected to +12/24V as “high” or state “1” and input status LED will glow.

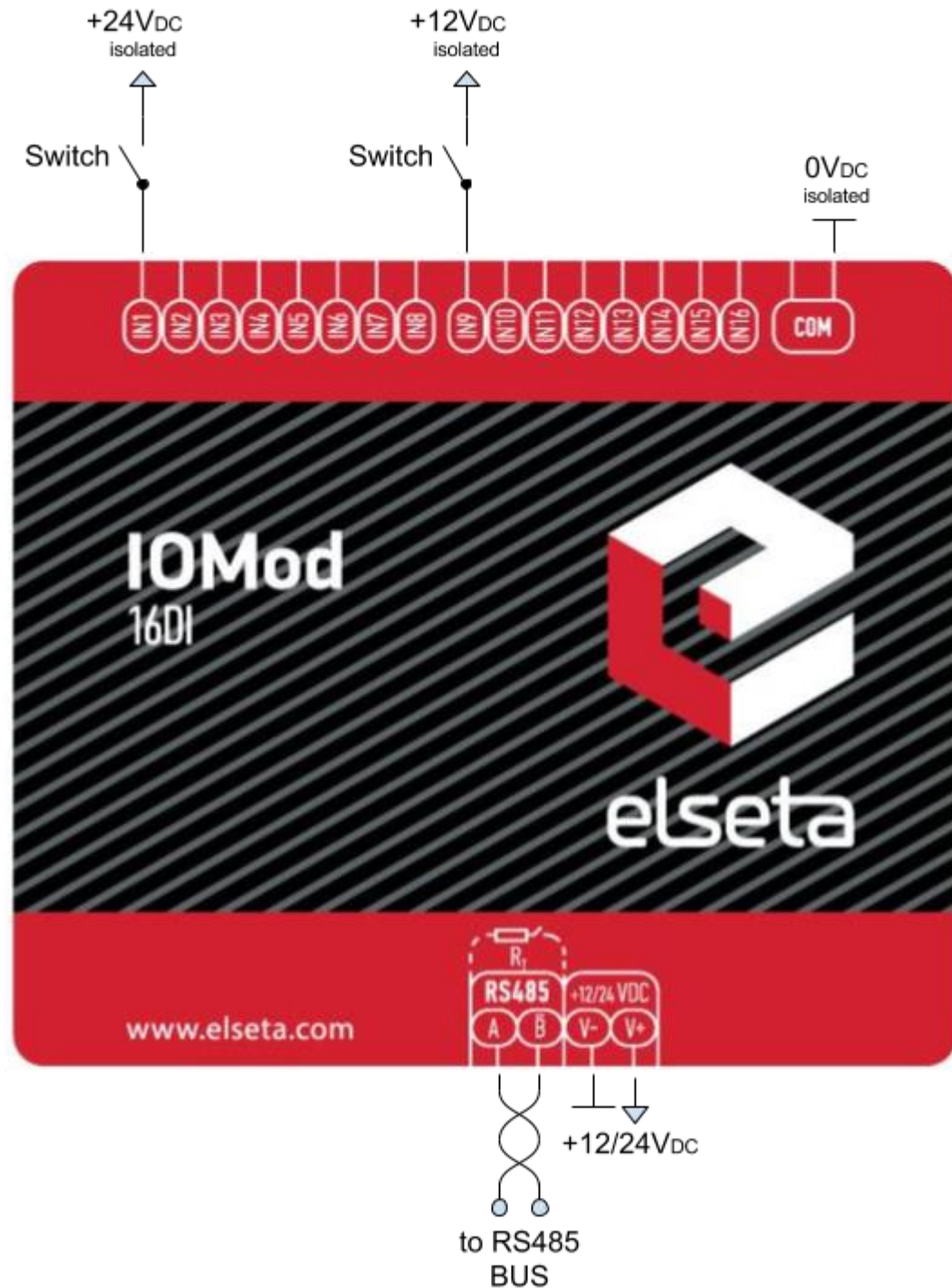


Fig. 5.2

User can setup inputs to be driven by 0V (Active low) signal (see Fig. 5.3). With this configuration, user will see inputs connected to 0V as “high” or state “1”, input status LED will glow.

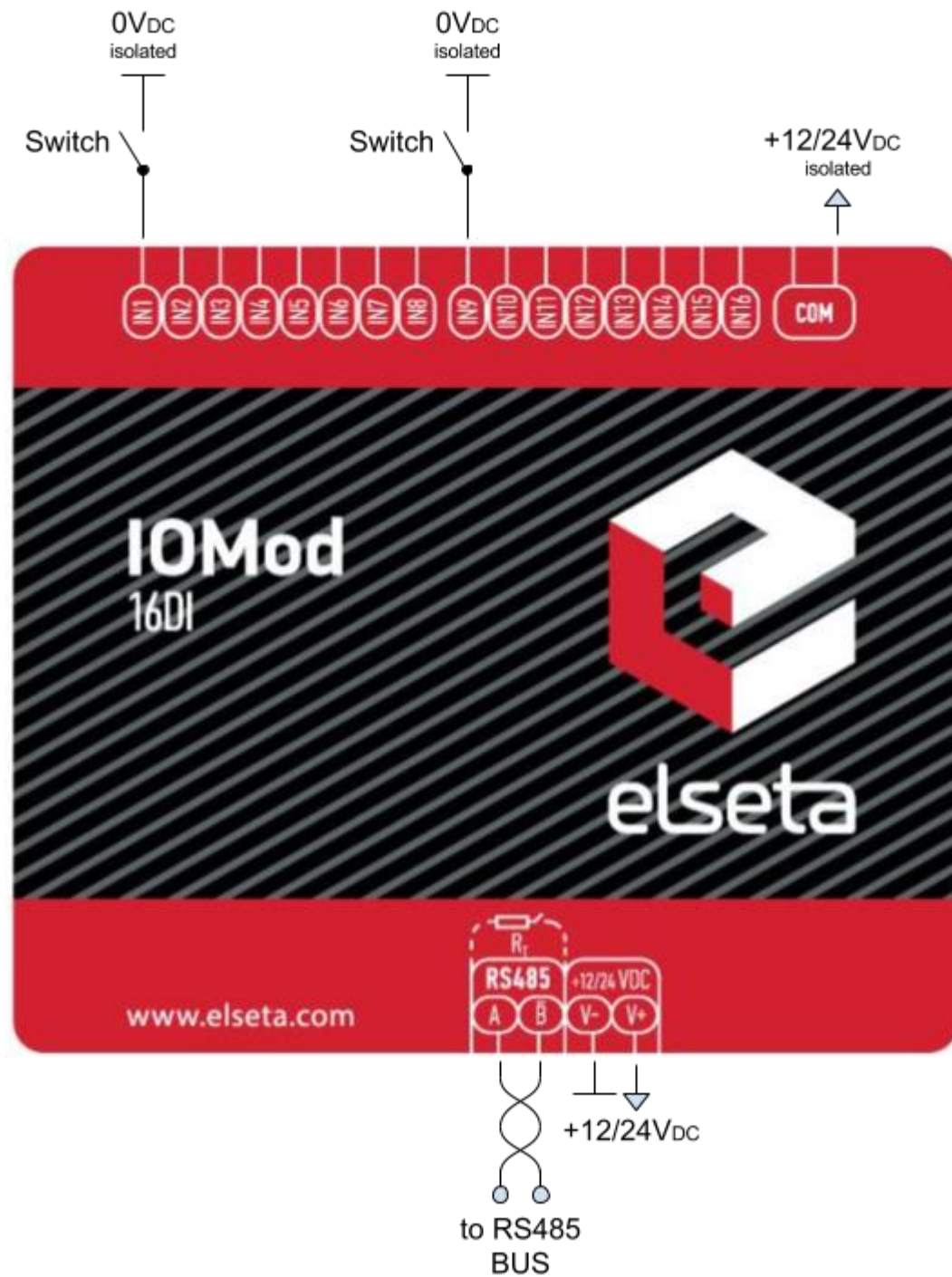


Fig. 5.3

6. Configuration over USB

a. Driver installation

Device requires USB drivers to work as virtual com port. First-time connection between device and computer could result in “Device driver software was not successfully installed” error.

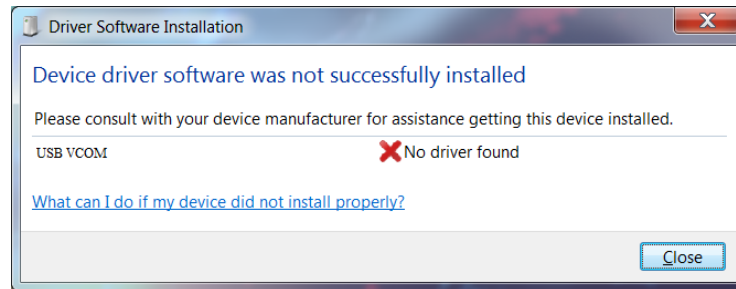


Fig. 6.1

User then manually installs drivers by selecting downloaded driver folder:
Go to Control Panel -> Device Manager;
Select failed device;
Press “Update driver software”; following screen should appear:

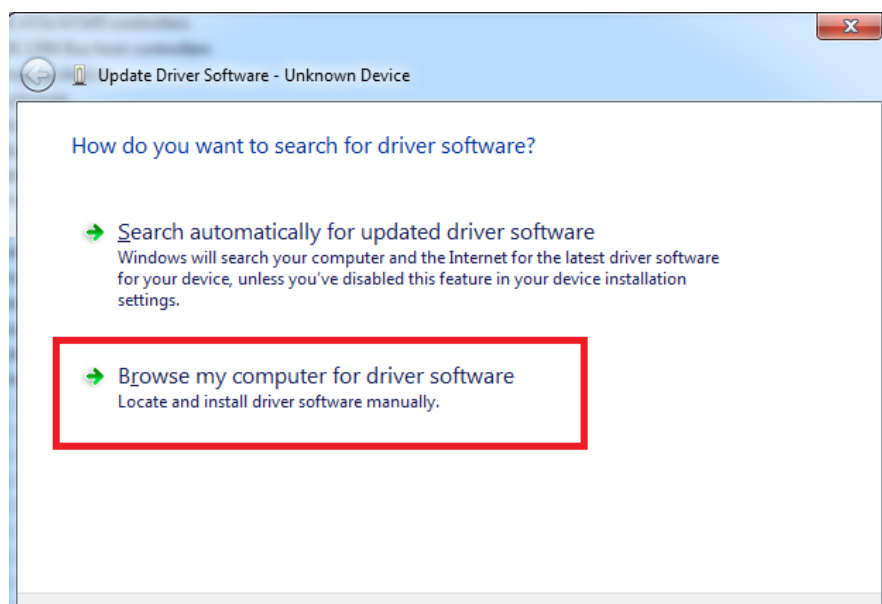
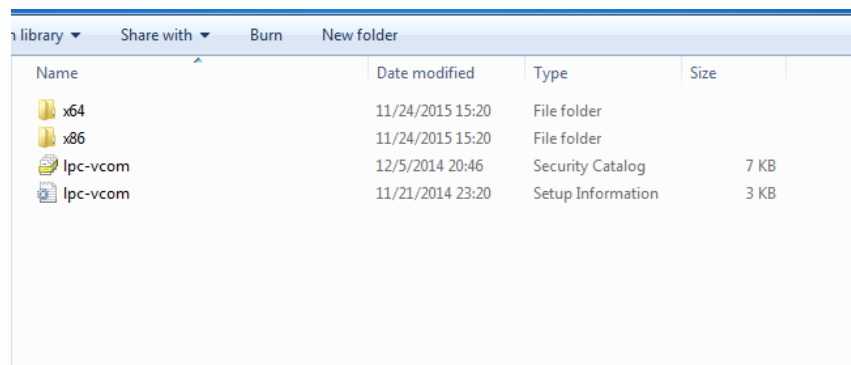


Fig. 6.2

Select “x86” driver for 32bit machine, or x64 for 64bit machine. If not sure, select root folder (folder in which x64 and x86 lays inside).



Name	Date modified	Type	Size
x64	11/24/2015 15:20	File folder	
x86	11/24/2015 15:20	File folder	
lpc-vcom	12/5/2014 20:46	Security Catalog	7 KB
lpc-vcom	11/21/2014 23:20	Setup Information	3 KB

Fig. 6.3

b. IOMOD configuration with PuTTY terminal

Configuration of IOMOD device is done through CLI (Command Line Interface) on virtual COM port. Drivers needed for MS Windows to install VCOM will be provided. To open up CLI simply connect to specific V-COM port with terminal software (advised to use PuTTY terminal software. If other software is being used, user might need to send <return> symbol after each command). When connected user should immediately see main screen:

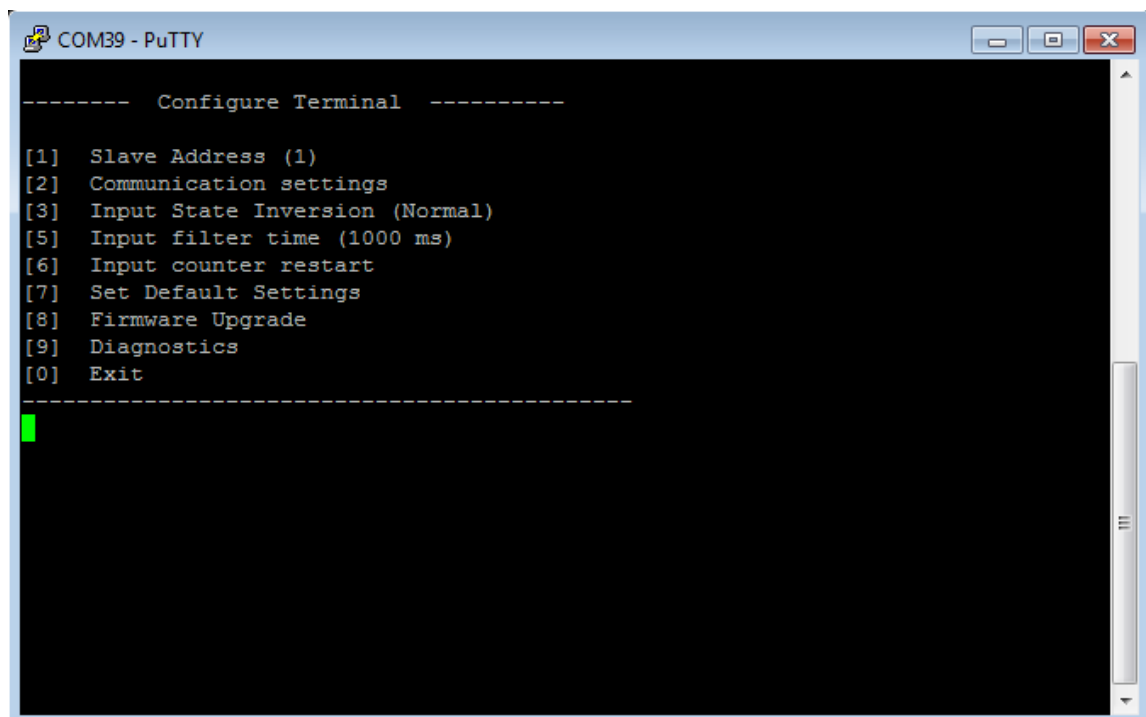


Fig. 6.4

Navigation is performed by sending number to terminal. User then proceeds by following further on-screen instructions. For example, to set Baudrate, press [2] to enter Baudrate screen; press [1] to edit; enter new configuration; press [RETURN] to save, or [ESC] to cancel changes. When done, press [0] (exit) before disconnecting device. Default values is set by pressing [6] on main screen, and confirming changes [1].

If accidentally closed the terminal window, user can connect terminal program again, and press any key on keyboard to show up main menu.

c. Main Menu

	Menu Name	Function	Values	Default Values
1.	Slave Address	Modbus Slave address / ID	1-247	(default: 1)
2.	Communication settings	Enters baudrate, data and parity bit, termination resistor screen	-	(default: 9600; 8+1+N; termination resistor - on)
3.	Input State Inversion	Input inversion (Inverts input states in modbus)	0 - 1 (off/on)	(default: 0)
5.	Input Filter time	Configures input pulse filter time	0 – 256000 (milliseconds)	(default: 100)
6.	Input counter restart	Restarts all input counter registers to 0	(1 to confirm, 0 to cancel)	-
7.	Set Default Settings	Sets Default Settings	(1 to confirm, 0 to cancel)	-
8.	Firmware Upgrade	Mass Storage Device Firmware Upgrade	(1 to confirm, 0 to cancel)	-
9.	Diagnostics	Input / Output states	-	-
0.	Exit	Exit and disconnect	-	-

d. Protocol simulator

When entered diagnostics screen, user can turn on protocol simulator by pressing [9]. When protocol simulator is turned on, device will communicate through USB port rather than RS-485 line. Communication on RS-485 line is closed and all Modbus commands will be accepted only from USB. To exit this mode user must restart device.

e. Firmware upgrade over USB

To update device firmware user must enter main configuration menu.

Enter Firmware update screen by pressing [4];

Confirm update by pressing [1];

Device now enters Firmware Upgrade mode.



It is recommended to close terminal window when entered firmware upgrade mode.

Device reconnects as mass storage device:

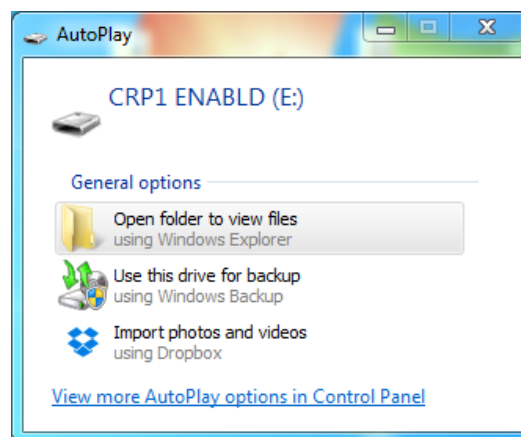


Fig. 6.5

User then must delete existing file “firmware.bin”, and simply upload new firmware file by drag and drop.

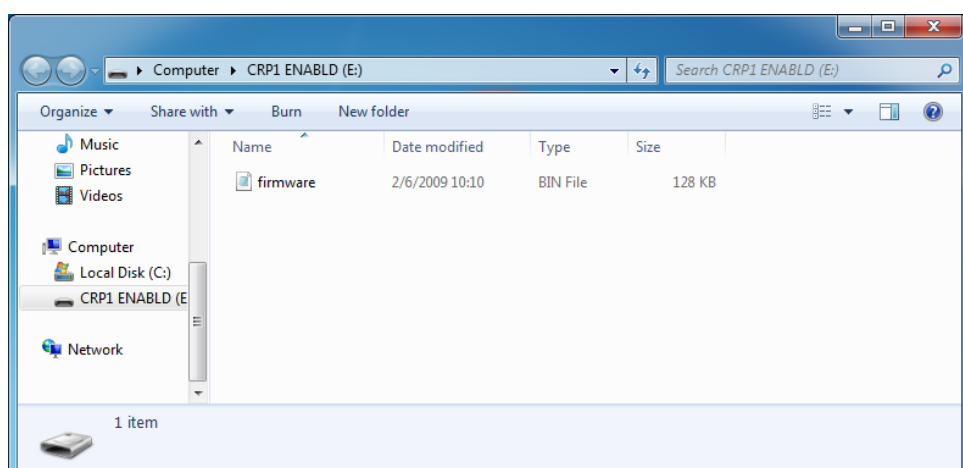


Fig. 6.5

Reconnect device and check firmware version.

7. Information of the equipment manufacturer



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8. Document history

Version	Date	Author	Description
v0.1	2015.12.15	L.S.	First version
v0.8	2016.05.10	L.S.	Major update. Added IEC-103 Description.
V0.9	2017.01.13	L.S.	Minor updates. Added protocol simulator description.
V0.99	2017.03.22	J.S.	Added connection diagrams
V1.0	2017.03.23	L.S.	Minor updates
V1.1	2017.04.14	L.S.	Added pulse count and ON time count descriptions