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# **VRD RFID reader**

with Ethernet interface

# **TECHNICAL GUIDE**

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# CONTENT

REVISION HISTORY	3
PURPOSE OF THE DOCUMENT	4
APPOINTMENT	5
TECHNICAL SPECIFICATIONS	6
CONNECTION	7
TCP/IP CONNECTION	9
OPERATION PROTOCOL	.12
VARIANTS OF SUPPLY AND ORDER INFORMATION	.17

#### **REVISION HISTORY**

REV	DATE	BY	SECTION	DESCRIPTION
1.01	2013.01.11	Evgeniy Vasyliev	All	First release
1.02	2021.09.22	Evgeniy Vasyliev		Changes web server look, reader schematics

# PURPOSE OF THE DOCUMENT

This Technical Guide is intended for studying of VRD RFID reader with Ethernet interface. It contains basic information regarding its technical characteristics, connection scheme and configuration.

Due to a reason that VRD RFID reader with Ethernet interface is constantly being developed in direction of improvements of their possibilities, changes are possible in its final version, which is not described in given Technical Guide.

During the system development process given Technical Guide will be also expanded and updated and new chapters will be added. Latest version of this Technical Guide can be downloaded from the VRD RFID reader with Ethernet interface web-page: *https://www.technotrade.ua/vrd-e-card-reader.html*.

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In case if you find any mistakes, omissions in this document or have any suggestions on improvements to this document, please feel free to e-mail them to our support mailbox: <u>support\_la@technotrade.ua</u>. We will be grateful to you for this valuable information.

All technical questions regarding the VRD RFID reader are welcome to be asked on support mailbox: <u>support\_1a@technotrade.ua</u>. Our support team will be glad to help you.

Also, you can call to us or visit us on:

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# APPOINTMENT

**VRD RFID reader with Ethernet interface** is intended for reading of EM-Marine contactless identifiers (125 kHz) and its transmission using Ethernet interface (optionally readers able to read Mifare identifiers (13.56 MHz) and EM-Marine identifiers (125 kHz) are present). Reader provides reading of code from distance from 50 to 100 mm (depending on the conditions of operation). At voltage +12 V standard distance for reading EM-Marine identifier at bringing the RFID tag in parallel to case of the reader is 70...90 mm. Distance for reading is lowering at mounting of the reader on the metal surface and close to sources of electromagnetic interferences.



VRD RFID reader

Reader is provided as for internal installation (near computer, in this case interface of the reader is Ethernet and its power supply is taken from USB-port of the computer) and also for outdoor installation in waterproof case and electrical board covered with weatherproof paint (for installation near fuel dispensers, in this case interface and power supply is taken from 12 V DC power supply).

*Note!* Avoid mounting of the reader directly on metal surfaces, use wooden or rubber spacers between metal surface and the reader with minimum 10 mm width.

Reader allows to configure buzzer and 2-colors LED for indication (green and red LEDs).



Example of reader installation on fuel dispensers

# **TECHNICAL SPECIFICATIONS**

Parameter	Value
Type of contactless identifiers read	EM-Marine (optionally Mifare + EM-Marine)
Power supply voltage	814 V DC
Average consumed current	200 mA
Peak consumed current	250 mA
Communication protocol	TCP/IP
Length of Ethernet cable	1 m
Dimensions	95 x 68 x 20 mm
Weight	100 g
Operation temperature range	-40+85 deg. C

### Dimensions



Dimensions of reader

# CONNECTION

Reader is equipped with 8-wire Ethernet cable, through which it is connected to Ethernet network and power supply is given (for power supply also USB interface cable can be used in readers for internal installation).

#### Pinouts of Ethernet cable

#### VRD variant for external usage

Color	Number	Appointment
White-orange	1	Standard Tx+
Orange	2	Standard Tx-
White-green	3	Standard Rx+
Blue	4	+U 814 V DC
White-blue	5	+U 814 V DC
Green	6	Standard Rx-
White-brown	7	GND
Brown	8	GND

#### VRD variant for internal usage (power supply from USB port)

Color	Number	Appointment
White-orange	1	Standard Tx+
Orange	2	Standard Tx-
White-green	3	Standard Rx+
Blue	4	Not used
White-blue	5	Not used
Green	6	Standard Rx-
White-brown	7	Not used
Brown	8	Not used

#### Electric scheme of connections

#### VRD reader for external usage









#### Mounting of reader

- 1. Define a place for reader mounting. It is recommended to install readers on distance not closer of 30 cm to each other.
- 2. Perform marking of holes for mounting of reader and laying of cables.
- 3. Lay the cable, fix it and perform required connections.
- 4. Check correctness of mounting and fix the reader in selected place using screws.
- 5. Connect power supply to reader.
- 6. After complete check of reader operation install decorative caps in holes of screws.

# **TCP/IP CONNECTION**

Configuration of reader parameters is done through a web-page. For this using any browser it is necessary to go to address <u>http://192.168.0.191</u>. Default user credentials to access configuration:

- login: "admin"
- password: "admin"

User credentials are saved in non-volatile memory of reader.

**NOTE!** These are defaults login and password. After their changing it is necessary to use new login and password for entering the web-page.

Default IP-address of reader is 192.168.0.191. Change of IP-address is made in the following way:

- 1. Connect power supply to the reader.
- 2. Connect RFID reader to local Ethernet network.
- 3. If your network is not 192.168.0.xxx, then set IP-address on your computer equal to 192.168.0.190.
- 4. Using any web-browser go to address http://192.168.0.191.
- 5. Go to tab "Сетевые настройки" with login "admin" and password "admin".
- 6. Set required network settings and save them.

	Reader EM-Marin - Etherne
Home	Ethernet
Network Settings	Augusta has made TCD Carver TCD Client
	Comes with default MAC address, which is customizable
	Restore to factory settings via hardware
	Provided TCP testing tool
	Example TCP Client code C# (Visual Studio)
	EM-Marine
	Working frequency: 125KHz
	Code type: 5 Bytes Read only
	Ethernet solutions.

General view of the page of reader adjustments (setting of IP-address, socket port, subnet mask, others):

twork Settings		
	WARNING: Changing the s communication.	ettings may result in the loss of
	MAC Address:	00:04:A3:01:00:01
	IP Address:	192.168.0.191
	Socket Port:	9761
	Gateway:	192.168.0.1
	Subnet Mask:	255.255.255.0
	Socket:	Server 🗸
	Server IP Addr:	192.168.0.192
	New password:*	
	Confirmation:	
	(up to 25 characters)	
		Save

List of configurable parameters:

- MAC-address in Ethernet network;
- IP-address of device;
- Socket port;
- Gateway;
- Subnet mask;
- Socket type;
- Socket server IP-address.

For data transmission through Ethernet it is necessary to set TCP/IP connection between computer and reader. At this software of computer should act as Socket-client if the reader is configured as Socket-server and on the contrary.

By defaults the reader is configured as Socket-server, this is specified in field "Socket" Content of field "Server IP Addr" at this is not used and may be any.

In case if it is needed to configure the reader to work as Socket-client select in field "Socket" a value "Client" and in field "Server IP Addr" – IP-address of Socket-server.

Information of configuration should be carefully saved. In case if this information is lost and you forgot reader's IP-address or password from the configuration web-page it is possible to make reset of all configurations to default. Default reader's settings are the following:

- IP-address: 192.168.0.191
- Socket port: 9761
- Gateway: 192.168.0.1
- Subnet mask: 255.255.255.0
- Login: 'admin'
- Password: 'admin'

#### Reset of configuration to default values

In order to perform reset of the reader's configuration (set default configuration to the reader) it is necessary to make the following:

- 1. Power off the reader
- 2. Take away the reader's casing and get to its electrical board
- 3. On electrical board of the reader find 2 contact pads (shown on the image below), you need to short connect them with each other (using tweezers or some other tool)
- 4. While these pads are connected with each other power on the reader and wait for 5 seconds
- 5. Disconnect the pads, the reader should be reset to default configuration



# **OPERATION PROTOCOL**

Connection is done using packets. Packet from reader to computer contains RFID tag identifier code. Packet from computer to reader is not required and is appointed to control over indication.

#### Transmission of RFID tag identifier code

At bringing of the RFID tag to the reader a coil antenna of reader receives 64 bits of data, from which 40 bits of data are useful code and the remaining 24 bits – service. Thus 40 bits of data is sent to PC (5 bytes).

5 bytes of useful code consist of two parts:

- 1-st byte: identified of company-manufacturer of RFID tag
- bytes 2-5: code of RFID tag

#### Format of packet from reader

Appointment	Length (bytes)	Data	
Packet start	1	One of the following bytes:	
		0x1F – Em-Marine type of reader	
		0x10 – Mifare type of reader (type 1)	
		0x01 – Mifare type of reader (type 2)	
RFID tag data	4		

Identifier of manufacturer as a rule is not used and thus fist byte of data can be eliminated from processing.

#### Control over indication

Indication of reader can work in one of five possible modes::

- 1. After connection a power source when connection to reader using socket TCP/IP connection is not done LEDs are in off state and buzzer is silent
- 2. State of connection lost when connection to reader was established but due to some reasons was interrupted. This is configurable state. By defaults intermittent flashing of red LED 1 time per second with duration 0.5 sec. At desire this state can be configured using a packet with code 0x1B.
- 3. State of normal operation when connection to reader is established and RFID tag is expected to be brought close to reader for reading of its code. By defaults in this state there is alternately flashing of red and green LEDs with interval of 0.5 seconds. At desire this state can be configured using a packet with code 0x1C.
- 4. State when RFID tag was just read, its code sent to computer and reader is waiting for response. By default frequent alternating flashing of red and green LEDs with interval of 0.2 sec during 10 seconds and single-time beeping during 0.5 sec. At desire this state can be configured using a packet with code 0x1D.
- 5. State when a response came from computer and it is necessary to show to user a result of decision regarding reading of his RFID identifier (refusal in access, success in registration, etc.). Duration of staying in this state is limited. This state does not have a default value cause assumes usage of packet from computer with command code 0x1E.

Commands for setting state of connection lost (point 2), state of normal operation (point 3) and state of RFID tag read (point 4) are sent 1 time after establishment of connection to reader and later are used in its

operation. They are not stored in non-volatile memory. Thus, if it is required to configure indication states different from default – each time after establishment of connection with reader the computer should send these commands.

Format of commands for setting of state in which indication should be constant at present of connection (command 0x1C) and at absence of connection (command 0x1B) is shown below.

Indication	Appointment	Length (bytes)	Data
	Command code	1	0x1B/0x1C
Red LED	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	
Green LED	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	
Buzzer	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	

**NOTE!** In state of connection absence reading of RFID tags is not performed.

For organization of flashing of one or both LEDs states A and B are set one-by-one. State A – start state of indicator. State B – next state. For switching on correspondent indicator it is necessary to set its value to 1, for switching off – to 0. All values of duration are set in 100 ms intervals. For example if it necessary to set a time period with duration 700 ms – then it is necessary to set correspondent value to 7. For constant lighting of some indicator it is necessary to set state A or state B in constant state.

#### Examples

Example 1. It is necessary to make flashing of red and green LEDs on the reader.

0x1C Command code for setting constant value for indication

- 0x00 Red LED in state A is switched off
- 0x03 Red LED in state A is during 300 ms
- 0x01 Red LED in state B is switched on
- 0x03 Red LED in state B is during 300 ms
- 0x01 Green LED in state A is switched on
- 0x03 Green LED in state A is during 300 ms
- 0x00 Green LED in state B is switched off
- 0x03 Green LED in state B is during 300 ms
- 0x00 Buzzer in state A is switched off
- 0xFF Buzzer in state A is during 25.5 s
- 0x00 Buzzer in state B is switched off

OxFF – Buzzer in state B is during 25.5 s

Example 2. It is necessary to make constant shining of red LED.

0x1C Command code for constant value of indication

0x01 – Red LED in state A is switched on

0xFF – Red LED in state A is during 25.5 s

0x01 - Red LED in state B is switched on

OxFF – Red LED in state B is during 25.5 s

0x00 - Green LED in state A is switched off

0xFF – Green LED in state A is during 25.5 s

0x00 – Green LED in state B is switched off

0xFF – Green LED in state B is during 25.5 s

0x00 – Buzzer in state A is switched off 0xFF – Buzzer in state A is during 25.5 s

0x00 – Buzzer in state B is switched off

OxFF – Buzzer in state B is during 25.5 s

Command for setting state when a RFID tag was read and a response is expected from computer is sent 1 time in the beginning of operation with reader. Each time after reading a RFID tag indication is set in this state in stays in it until one of the following events:

- duration of stay in this state is elapsed;
- response from computer is received and indication is transferred in a state of showing received response.

**NOTE!** Reading of RFID tags in this state is stopped.

Format of command for setting such indication is shown below.

Indication	Appointment	Length (bytes)	Data
	Command code	1	0x1D
	Duration of response expectation	1	
Red LED	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	
Green LED	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	
Buzzer	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	

Example 3. It is necessary 1 time per 500 ms to give out a sound signal and frequently flash with green and red LEDs.

0x1D – Command code for setting indication of response expectation

0x64 – Duration of indication of response expectation during 10 s

0x00 - Red LED in state A is switched off

0x01 – Red LED in state A is during 100 ms

0x01 - Red LED in state B is switched on

0x01 – Red LED in state B is during 100 ms

0x00 – Green LED in state A is switched on

0x01 – Green LED in state A is during 100 ms

0x00 – Green LED in state B is switched off

0x01 – Green LED in state B is during 100 ms

0x01 - Buzzer in state A is switched on

0x05 – Buzzer in state A is during 500 ms

0x00 – Buzzer in state B is switched off

0xFF – Buzzer in state B is during 25.5 s

Command for setting a state when a response from computer has come means a result of made decision on read RFID tag (refusal in access, success of registration, etc.) and is to be received each time after reading a tag. Indication in this state has limited duration. Total duration of indication has higher priority than duration of states.

Format of command for setting such indication is shown below.

Indication	Appointment	Length (bytes)	Data
	Command code	1	0x1E
	Duration of indication	1	
Red LED	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	
Green LED	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	
Buzzer	State A	1	
	Duration of state A	1	
	State B	1	
	Duration of state B	1	

<u>Example 4</u>. It is necessary to show permission for access -2 times give out sound signal with 1 second duration each and during this time shine with green LED.

0x1E – Command code for setting indication for result of made decision

0x17 – Duration of indication of made decision during 2.5 s

0x00 – Red LED in state A is switched off 0xFF – Red LED in state A is during 25.5 s

0x00 - Red LED in state A is during 23.3 s

0x00 - Red LED in state D is switched on

0xFF – Red LED in state B is during 25.5 s

0x01 – Green LED in state A is switched on

0x17 – Green LED in state A is during 2.5 s

0x00 – Green LED in state B is switched off

0xFF – Green LED in state B is during 25.5 s

0x01 - Buzzer in state A is switched on

0x0A – Buzzer in state A is during 1000 ms

0x00 – Buzzer in state B is switched off

0x05 – Buzzer in state B is during 500 ms

# VARIANTS OF SUPPLY AND ORDER INFORMATION

Variant of VRD RFID reader supply is marked with VRD-y-z, where

- y type of reader:
  - *"INT"* in case if VRD reader is supplied for internal usage (power is taken from USB-port of PC)
  - *"EXT"* in case if VRD reader is supplied for external usage and electrical board covered with weatherproof paint (power wires go inside Ethernet cable)
- z variant of variant of RFID readers:
  - 001 reader equipped with Em-Marine RFID reader
  - 002 reader equipped with Em-Marine + Mifare RFID readers

Examples of order:

- order of VRD RFID reader for internal installation with power supply from USB-port and equipped with Em-Marine reader: VRD-INT-001
- order of VRD RFID reader for external installation and equipped with Em-Marine + Mifare readers: VRD-EXT-002