



MCR04G RFID Reader

Ethernet

13,56 MHz ISO14443

User Manual

June 2022 Rev 1.0

Minova Technology GmbH

Company Headquarters
Auf dem Wall 29
78628 Rottweil
Germany

www.minovatech.de

The information contained herein is provided solely for the purpose of allowing customers to operate and service Minova manufactured equipment and is not to be released, reproduced, or used for any other purpose without written permission of Minova Technology. Information and specifications contained in this document are subject to change without prior notice and do not represent a commitment on the part of Minova Technology.

© 2022 by Minova Technology GmbH. All rights reserved.

Revision History

Changes of this document are listed below:

Date	Rev	Note
10.06.2022	1.0	Standard release

Table of Content

1	Introduction.....	5
2	Server & Client Protocols	5
2.1.1	TCP/IP Client Mode Operation.....	5
2.1.2	TCP/IP Server Mode Operation	5
3	Terminal Setup & Settings.....	5
3.1	miFinder Configuration Software	6
3.1.1	Automatic IP (DHCP) Mode.....	8
3.1.2	Constant / Static IP Mode.....	8
3.1.3	Client and Web Client Modes of Operation.....	9
3.2	Message Formats from Server to Terminal.....	10
3.2.1	Example Operation.....	11
4	Offline Mode of Operation	12
4.1.1	Offline examples:	13
5	Example Operation with GSA.....	14
6	Test Connection with Hercules.....	15

1 Introduction



MCR series are high performance and flexible ISO14443-A OEM contactless smart card readers supporting read-write capabilities. The readers are based on the 13.56 MHz contactless technology and are fully compatible with the entire MIFARE® family, as well as supporting ISO14443A contactless standard. The readers come with Ethernet connectivity and have extensive software support package that is optimized for easy integration.

2 Server & Client Protocols

MCR Ethernet Terminals can be used in either Client or Server. In client mode the terminal connect to a remote server that it listening a TCP/UDP port. Server may accept multiple connections. MCR Terminals can be used as Server. The terminal listens own port and can accept a connection request from outside. In this case terminal's IP number is to be static. It depends on the application whether the terminal is in Client or Server mode.

2.1.1 TCP/IP Client Mode Operation

When the terminal is set to operate in client mode it tries to connect a remote server IP & Port set in configuration.

2.1.2 TCP/IP Server Mode Operation

When the terminal is set to operate in server mode it listens own TCP port to accept outcoming request from other clients.

3 Terminal Setup & Settings

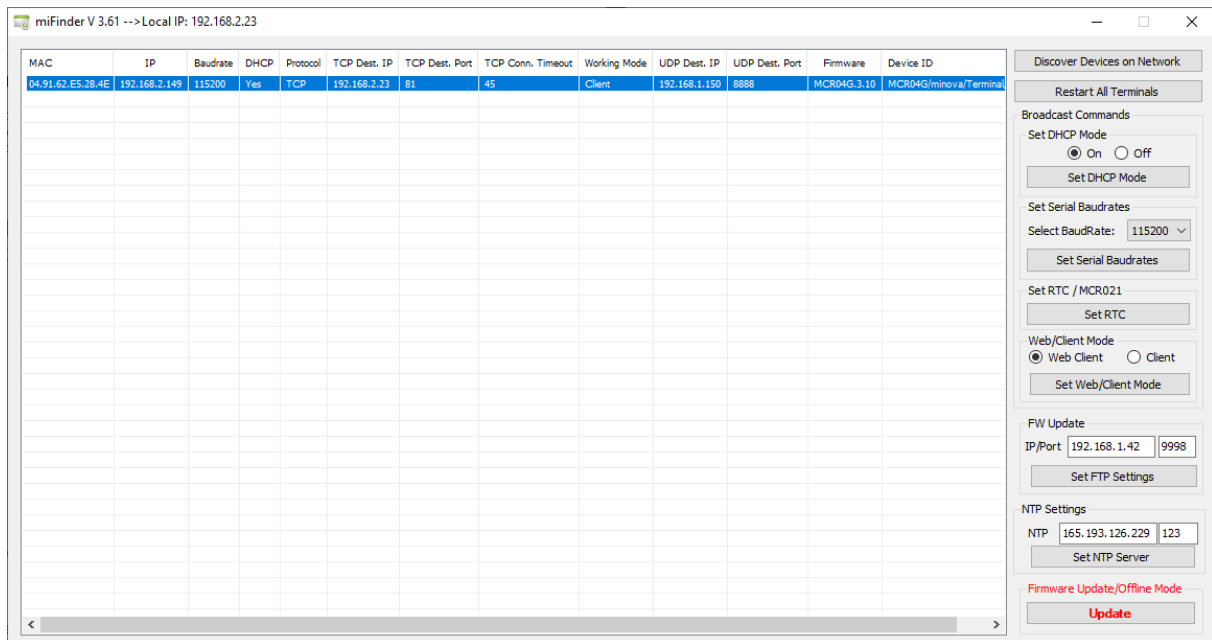
The terminal can be configured on a network (LAN). To start setup terminal must be in a network that supports DHCP. The terminal needs to acquire an IP from a DHCP server on your network. Configuration is made through and UDP protocol so it advisable to use a firewall free network. Most of the firewalls filter UDP.

For the first time setup you can use miFinder software. miFinder can discover all terminals on your network. After MCR0x is up i.e. (after gained an IP from your network) you can use miFinder. It is also advisable to turn off any firewall & antivirus software before running miFinder. As stated before, firewalls on PC may prevent to discover the network.

3.1 miFinder Configuration Software

Using miFinder you can set various parameters related to terminals. Some parameters are specific to each terminal and some parameters are global to all terminals. After all setup, your device is listed or discovered as given below.

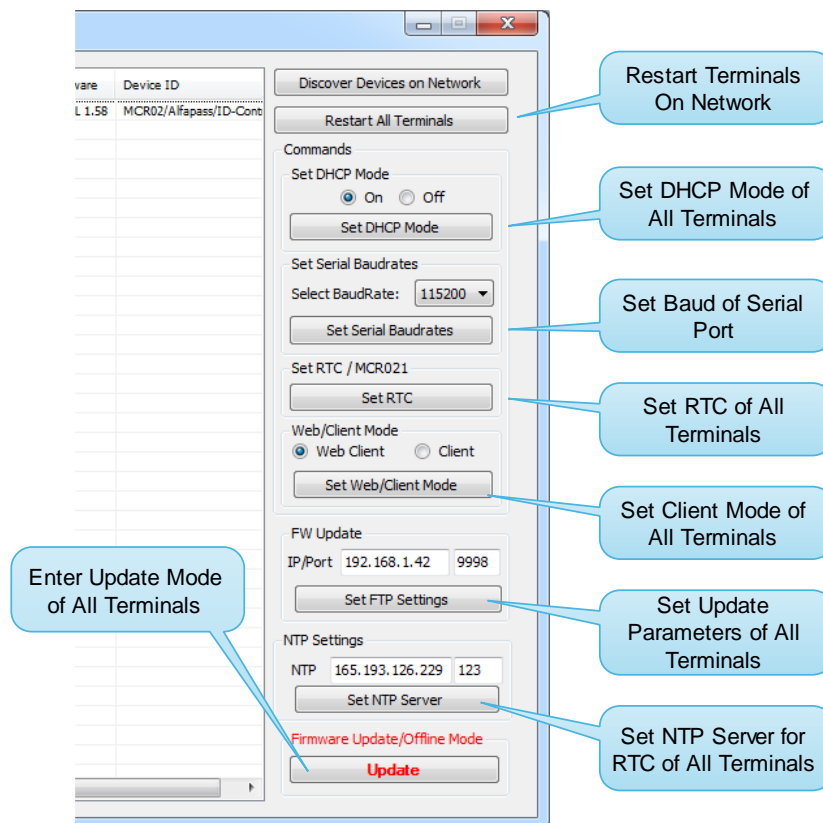
If your terminal is not discovered, press Discover button again.



miFinder Main Screen

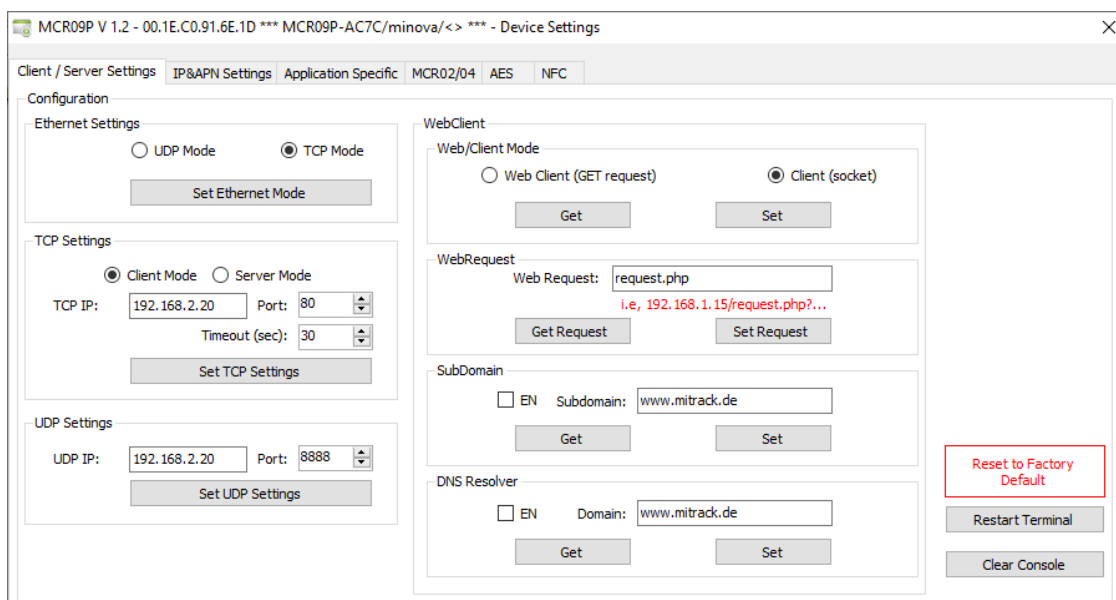
In main window of miFinder you can the following parameters

- Restart or Reset all terminals connected to network.
- Setting DHCP parameter of all terminals connected to network.
- Setting the baud-rate of RS232 / RS485 / USB port.
- Setting the Real Time Clock of all terminals connected to network.
- Setting the Client mode type: Web or Normal Socket Client of all terminals connected to network.
- Setting the remote parameters or firmware update of all terminals connected to network.
- Setting the remote NTP server parameters of all terminals connected to network. NTP server can be used to set automatically if the device can access internet (www).
- Enter to update mode to check firmware update of all terminals connected to network.



miFinder main window view

To enter a detailed setup of a particular terminal select a device from the list and double click to see a particular terminal setting window in miFinder. This window gives you a detailed setup of each terminal. Please note that these settings are specific to each terminal. Below given a snapshot of detailed settings window of miFinder.



miFinder Terminal Setting Window

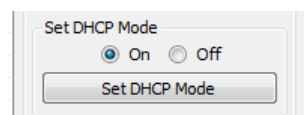
This setting window gives you to:

- Set the terminal IP static or dynamic
- Set protocol type of operation of the terminal: UDP or TCP

- Set UDP remote ip & port
- Set TCP operation mode: Client or Server
- Set TCP remote ip and server port
- Set remote request file with GET in Web-Client mode
- Set / Clear Relays to test
- Give a alias name to terminal (i.e. MCR_Gate1 etc.)
- Set & View LCD Screen Texts (App. Specific section)

3.1.1 Automatic IP (DHCP) Mode

In miFinder’s main screen, in Set DHCP Mode section, select ON and press Set DHCP Mode button. Then all terminals restart and try to access a DHCP server to get an IP address from your network. Please note that your network must have a DHCP enabled management device.



DHCP Mode Setting

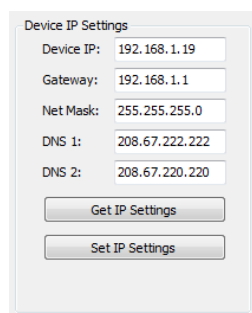
3.1.2 Constant / Static IP Mode

The terminal is set up with the following IP parameters for static operation at factory.

Parameter	Value
IP Address	192.168.1.100
Gateway Address	192.168.1.1
Net Mask	255.255.255.0
Primary DNS	192.168.1.1
Secondary DNS	192.168.1.1

However, most of the terminals manufactured are set to operate in DHCP mode. Static IP mode is not preferred for mass productions. The default setting for all terminals is DHCP.

To set a terminal to be run in static IP mode, in miFinder’s main window enter the desired terminal’s settings screen. Then enter your desired IP, GW, Mask and DNS values in Device IP Settings section.



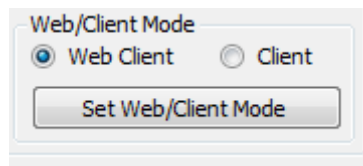
IP Parameters Settings Section

Note that, after opening settings screen, this section gives your terminal’s current IP parameters. After entering the values as above figure, then press Set IP Settings button. Then the terminal restarts again.

The last step is to set DHCP mode to OFF in main window of miFinder as given in Figure-4. The terminal restarts again in Static IP mode. Please note that you can skip this step if your terminal is already operating in static IP mode.

3.1.3 Client and Web Client Modes of Operation

Any MCR0x terminal can connect to web server or server as client. The terminal's client mode of operation can be altered in main screen of miFinder as in Figure-6.

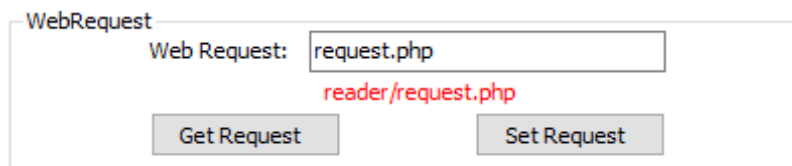


Web Client or Normal Client Mode Setting

When a contactless card is detected by the terminal, it tries to send card's UID to server as follows:

Operation Type	Example Terminal Request
Web Client	<i>GET /request.php?devID= MCR04-1000&UID=F0C189A5</i>
Client (Socket)	<i>MCR04-1000,UID=F0C189A5</i>

It is seen that the terminal tries to send data to a web-server by requesting a PHP file. You can also change this request in miFinder's setting window.

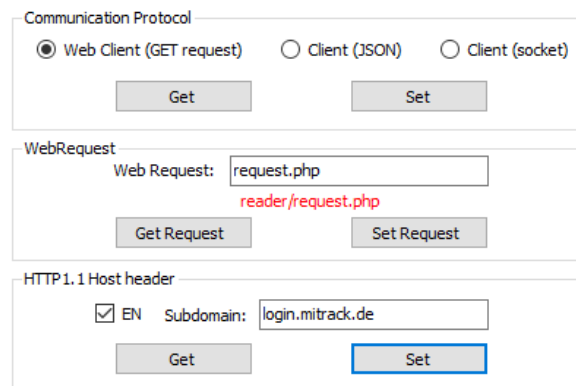


Http request file name for Web-Client Mode

HTTP1.1 mode with host domain

GET /request.php?devID=MCR04-1000&UID=04286CD29C3981 HTTP/1.1

Host: login.mitrack.de



3.2 Message Formats from Server to Terminal

The message format from server to terminal is given by the following syntax.

<Device ID>,<CMD1;parameter1;...;10parameter>,<CMD2;parameter1;...;10parameter>,...

This packet can be sent by a specific TCP server via socket_send API's or simple echo statements defined in a web server protocols.

Command	Description	Parameter
LCDCLR	Clears LCD	None
LCDSET	Write Text to LCD	Left;Top;Font_Type;Text Example: LCDSET;0;0;0;Hello World
LCDLOCK	Locks the display	None
LCDUNLOCK	Releases the display	None
MSG;TEXT	Shows a message with beep sound	MSG;Thank you After display timeout, returns to default screen
DELAY;TIME	Waits defined time long in ms	DELAY;500
BUZZER	Execute Buzzer	DelayMs,beepTimes Example: (300 msec. period with 1 time Beep) BUZZER;300;1
TRST	Terminal reset	none
ALIVE	Alive message is sent by the Terminal periodically	If desired the server can send commands as reply.
RELAY1=xx	Energize Relay-1 by Delay in Ms.	XX Delay in Milliseconds. The Relay is ON with XX Delay.
RELAY2=xx	Energize Relay-2 by Delay in Ms.	XX Delay in Milliseconds. The Relay is ON with XX Delay.
RELAY1=ON RELAY1=OFF	Relay-1 ON or OFF all the time.	ON / OFF
RELAY2=ON RELAY2=OFF	Relay-2 ON or OFF all the time.	ON / OFF
TSYNC=UNIX_TIME	Set Terminal's RTC from server.	UNIX_TIME This is a Unix time stamp value. Ex: TSYNC=256984235
WLIST_ADD	White list add UID Type UID Start date/time End date/time	TYPE;UID;START;END TYPE=0 UID only, T=1 UID with date/time control UID= UID decimal START=Unix time stamp END= Unix time stamp Ex: WLIST_ADD;1;3187729446;1420074061;1422842522 Terminal answer: WLIST_ADD,ACK
WLIST_REM	White list remove UID	UID Ex: WLIST_REM;3187729446 Terminal answer: WLIST_REM,ACK
WLIST_CLR	Clear white list	NONE Terminal answer: WLIST_CLR,ACK
WLIST_GET=xx	Read UID form list	INDEX Ex: WLIST_GET=12 Terminal answer: WLIST_GET,TYPE,UID,START,END or WLIST_GET,NAK (index not exists)
LIST_INFO	Get list counters	NONE Terminal answer: LIST_INFO,WLIST_COUNT ,WLIST_CHKSUM,BLIST_COUNT,ACTIVITY_COUNT
ACT_CLR	Clear activity file	NONE Terminal answer: ACT_CLR,ACK
ACT_GET=	Read activity record	INDEX Ex: ACT_GET=12 Terminal answer: ACT_GET,TYPE,INF,UID,TIMESTAMP or ACT_GET,NAK (index not exists)

ACK_STR	Set offline ACK string Max. 120 Bytes long	Command string Ex: ACK_STR;RELAY1=1500,BUZZER;50;2
NAK_STR	Set offline NAK string Max. 120 Bytes long	Command string Ex: ACK_STR;BUZZER;500;1, LCDCLR,LCDSET;10;20;2;DENIED;
MSG_TEXT	Update display message	DISPL_TEXT Ex: MSG_TXT;TAG YOUR CARD
INPUTS	Return inputs	NONE Terminal answer: INPUTS,INPUT0,INPUT1,INPUT2,INPUT3 Ex: INPUTS,IO0=0,IO1=0,IO2=0,IO3=1
INPO_STR	Set input 0 string	Command string Ex: INPO_STR;LCDCLR,LCDSET;7;25;3;DO NOT DISTURB,LCDLOCK
INP1_STR	Set input 1 string	Command string Ex: INP1_STR;LCDCLR,LCDSET;7;25;3;EMPTY,LCDLOCK
STR_GET	Get stored strings	INDEX Terminal answer: Command String Ex: STR_GET=0;
BARCODE	Activate and scan	NONE Terminal answer: ACK,BAR_CODE,INPUTS
GET_UID	Get the UID of the shown card	NONE Terminal answer: UID
GET_TYPE	Get ATQ and SAK bytes of the card	Terminal answer: CARDTYPE=0400;20
LOADKEYS;TYPE;KEYA;KEYB	Load mifare keys	LOADKEYS;0;A0A1A2A3A4A5; B0B1B2B3B4B5
BLOCKREAD;BLOCKNR BLOCKREADX;BLOCKNR	Read 16 bytes mifare block Read 16 bytes in HEX mode	BLOCKREAD;2 Answer: BLOCKDATA=Test string 1 Answer: BLOCKDATAx=000102030405060708090A0B0C0D0E0F Answer: NAK block authentication error
BLOCKWRITE;BLOCKNR;DATA BLOCKWRITEX;BLOCKNR;DATA	Write max 16 bytes mifare block Write max 16 bytes in HEX mode	BLOCKWRITE;2;Test BLOCKWRITEX;2;000102030405..
FORMATSECTOR;SECTORNR;DATA	Format a sector	FORMATSECTOR;1; FFFFFFFFFFFFFFFF078069FFFFFFFFFFFF
SECTORREAD;SECTORNR SECTORREADX;SECTORNR	Read 48 bytes of sector data Read 48 bytes in HEX mode	SECTORREAD;1 SECTORREADX;1
SECTORWRITE;SECTORNR;DATA SECTORWRITEX;SECTORNR;DATA	Write max 48 bytes of sector data Write max 48 bytes in HEX mode	SECTORWRITE;1;MAX MUSTERMAN MUSTERSTRASSE 2 MUSTERSTADT
CAPDU;APDU[0]..APDU[n]	Send APDU DESFire or Bank Card	SELPPSE:CAPDU; 00A404000E325041592E5359532E444446303100 Anser: RAPDU=06675041259000

3.2.1 Example Operation

The Terminal sends the following to Server:

MCR04-1000,UID=3187729446,IO=0F

The Server may send the following to Terminal:

MCR04-1000,BUZZER;500;1,LCDCLR,LCDSET;0;0;0;Test1,LCDCLR,LCDSET;0;10;0;Hello World!
or MCR04-1000,BUZZER;500;1,LCDCLR,LCDSET;0;0;0;Test1,LCDCLR,LCDSET;0;10;0;Hello World!,RELAY1=500

Web-Client Mode Message:

GET /request.php?devID=MCR04-1000&UID=2492345374 HTTP/1.0\r\n\r\n

Web-Client Mode Alive Message:

GET /request.php?devID=MCR04-1000&cmd=ALIVE&io=0F HTTP/1.0\r\n\r\n

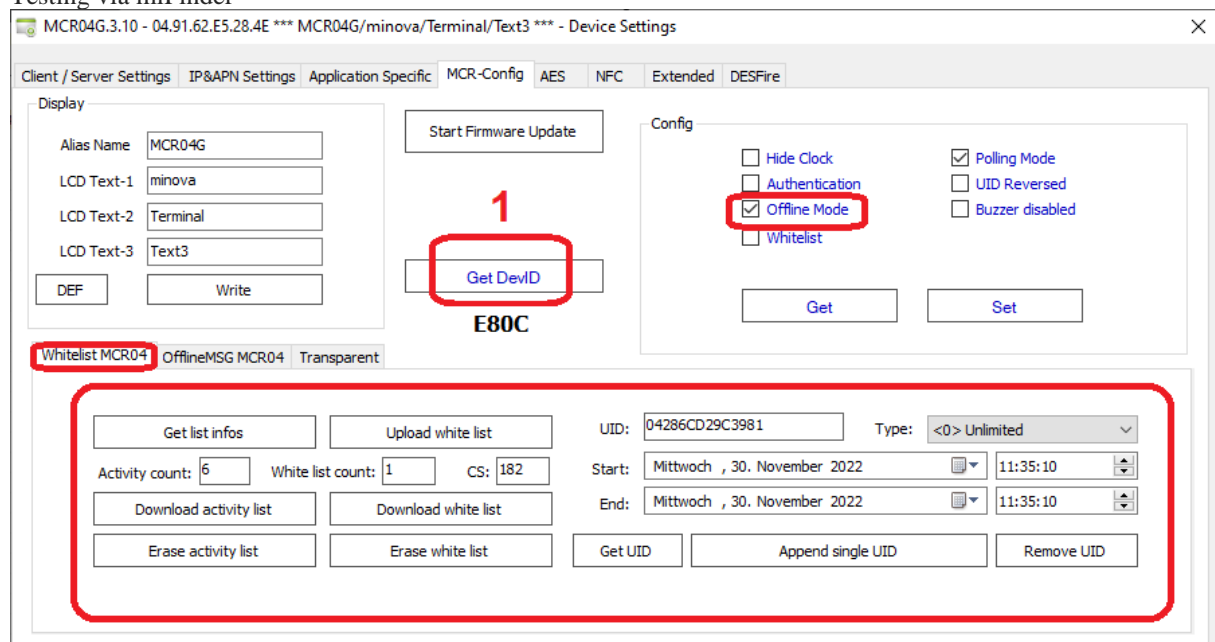
4 Offline Mode of Operation

Offline mode is automatically activated as soon as the server connection is broken, or the Ethernet cable was disconnected. To be sure that this mode works correctly, the following offline strings must be defined.

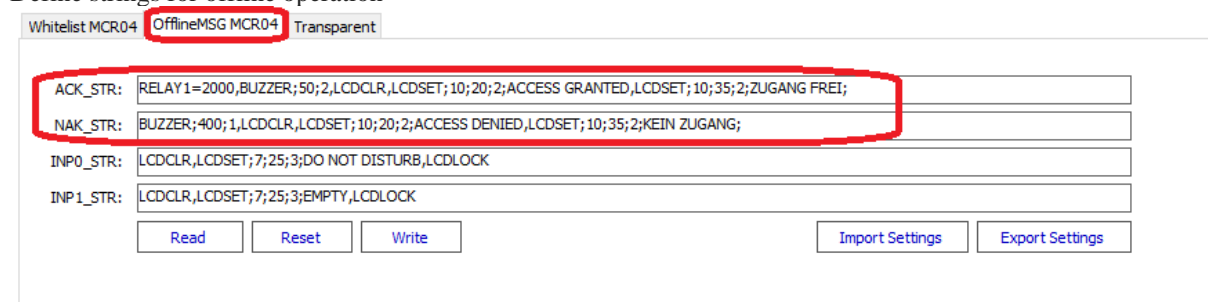
- ACK_STRING: Will be called in case of a card is tagged and the UID is in white list
- NAK_STRING: Will be called in case of denied card
- MSG_STR: Defines the 3th line text of the display permanently
- INP0_STR: Will be called when the input 0 is activated
- INP1_STR: Will be called when the input 1 is activated

After the server is again reachable or the Ethernet cable is reconnected, the reader switches to online mode within some seconds.

Testing via miFinder



Define strings for offline operation



In offline mode, depending on the whitelist, the **ACK_STR/NAK_STR** commands will be processed by card readings.

Offline Whitelist and Activity File

Up to 4000 UIDs and 5000 activity records can be stored in the internal memory.

Examples to initialize the whitelist:

* Clear the white list. All stored UIDs will be deleted.

MCR04-1000,WLIST_CLR

* Add an UID to the list. Type = 1, UID =3187729446, time/control between 20.03.2011 - 20:49:57 and 20.03.2015 - 20:49:57
MCR04-1000,WLIST_ADD;1;3187729446;1300650597;1426880997

* Remove an UID from the list. UID =3187729446
MCR04-1000,WLIST_REM;3187729446

* Get the UID index 0
MCR04-1000,WLIST_GET=0

* Get list info.
MCR04-1000,LIST_INFO

After this command, the UID list count, the list checksum and the activity length will be returned. The server can check the list checksum to update the complete list.

* Get an activity record.
MCR04-1000,ACT_GET=0

Example: MCR04-1000,ACT_GET,0,0,3187729446,1422913388

Activity type 0 (UID activity)

Activity info 0

UID 3187729446

Timestamp 02.02.2015 - 22:43:08

* Clear the activity list. All activity records will be deleted.
MCR04-1000,ACT_CLR

4.1.1 Offline examples:

Activity file

MCR04-1000,LIST_INFO
MCR04-1000,ACT_GET=0
MCR04-1000,ACT_CLR

White list

MCR04-1000,WLIST_GET=0
MCR04-1000,WLIST_CLR
MCR04-1000,WLIST_ADD;1;3187729446;1300650597;1426880997
MCR04-1000,WLIST_REM;3187729446

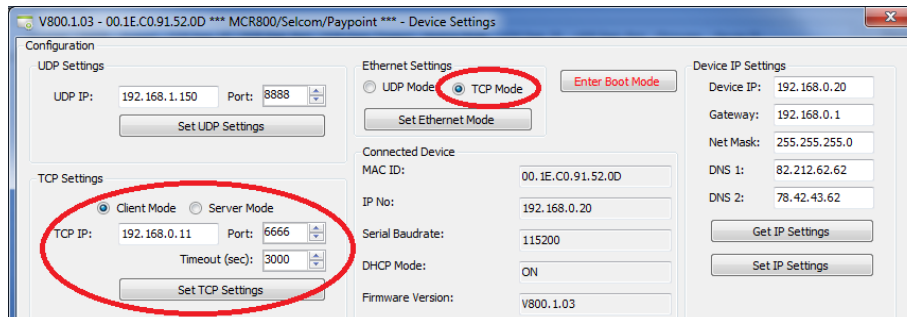
Offline strings

MCR04-1000,ACK_STR;RELAY1=500,BUZZER;50;2,RELAY2=1000,LCDCLR,LCDSET;10;20;2;ACCESS GRANTED,LCDSET;10;35;1;OFFLINE;
MCR04-1000,NAK_STR;BUZZER;300;1,LCDCLR,LCDSET;10;20;2;ACCESS DENIED,LCDSET;10;35;1;OFFLINE;
MCR04-1000,MSG_TXT;TAP YOUR CARD
MCR04-1000,INP0_STR;LCDCLR,LCDSET;7;25;3;DO NOT DISTURB,LCDLOCK
MCR04-1000,INP1_STR;LCDCLR,LCDSET;7;25;3;EMPTY,LCDLOCK

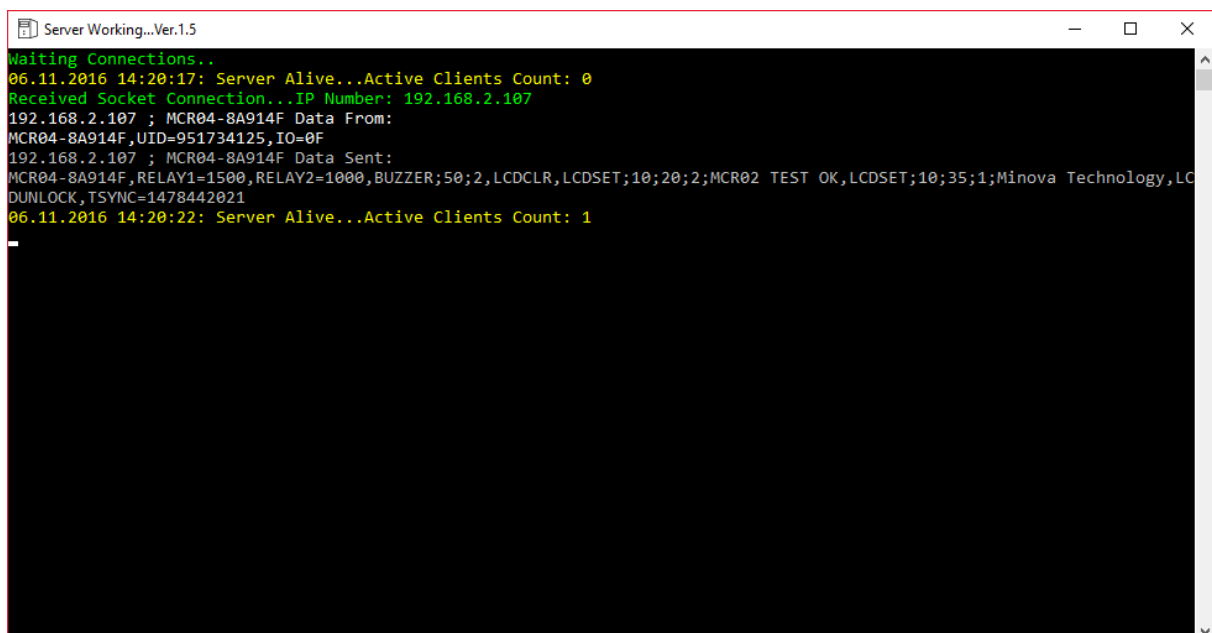
5 Example Operation with GSA

The **GSA_Testserver.exe** can be used to test the server connection. More than one terminal can connect to this multi-thread server application.

- Set terminal's TCP/IP address to your IP and port 6666



- Run the **GSA_Testserver.exe** application and wait until the terminal is connected
- Present a contactless card to the terminal



The Terminal sends the following to Server:

MCR04-1000,UID=1E2C8E94

The Server may send the following to Terminal:

To approve:

MCR04-1000, RELAY1=1500,BUZZER;50;2,LCDCLR,LCDSET;10;20;2;ACCESS GRANTED,LCDSET;10;35;1;Minova Technology,TSYNC=1475792451

To deny:

MCR04-1000, BUZZER;500;1,LCDCLR,LCDSET;10;20;2;ACCESS DENIED,LCDSET;10;35;1;Minova Technology,TSYNC=1475792451

The server application adds to each response the TSYNC command with the actual Unixtime. This way the RTC is always synchronized with the server.

The source code of this server project is included in the SDK.

6 Test Connection with Hercules

Hercules Setup Utility can be used to test the terminals behavior.

- Select TCP Server and enter the Terminals port number
- Click on **Listen**
- The terminal will connect automatically as seen in the connection status
- After presenting a card, the message will be displayed in the **Received data** window
- Enter the response message and send to the terminal. The device ID must be the same in the received and sent data
- As the TCP connection is open, we can send commands directly to the terminal

