User manual

CCR100-DK
Development kit

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1. Important safety instruction

When using your CCR100-DK, basic safety precautions should always be followed to reduce risk of fire, electrical shock, and injury to persons. In addition, the following should also be followed:

1. Read and understand all instructions.

2. Follow all warnings and instructions marked on the product.

3. Do not use liquid cleaners or aerosol cleaners. If necessary use mild soap.

4. This product should be operated only from the type of power source indicated on the marking label. I you are not sure of the type of the power supplied to your installation site, consult your dealer or local power company.

5. Never push objects of any kind into this product or through cabinet slots as they may touch voltage points or short out parts that could result in fire or electrical shock. Never spill liquid of any kind on the product.

6. To reduce the risk of electrical shock, do not disassemble this product by your self, but take it to qualified service whenever service or repair is required.

7. Unplug this product from the Direct Current (DC) power source and refer to qualified service personnel under these conditions:
    - When the power supply cord or plug is damaged or frayed.
    - If liquid has been spilled on the product.
    - If the product does not operate normally after following the operating instructions in this manual.
    - If the products exhibits a distinct change in performance.

2. Introduction

2.1 Overview

A properly configured proximity reader with 10BaseT is an intelligent device, which integrate interface for reading proximity cards, single microprocessor and Ethernet controller. Hyper Terminal is used to set up CCR100-E10 over RS232 communication port. As for any other single computer, IP address, default gateway and subnet mask must be set. Application software and CCR100-E10 communicate by UDP packets, thus source and destination port has to be set. Number of devices working in defined system is limited by capacity of LAN. Every single device has a unique ID, which is identification number in application database.

CCR100-E10 has default set of commands to operate with relay module, sound signals, LED's and etc. Commands and communication protocol are described below in this user manual.

Tamper switch is installed on the backside of the device to prevent removing device from the wall.

To improve CCR100-E10 performance, sound and LED signals are integrated into it. With commands it is possible to manage and control these signals.

A small relay board is also included into this development kit. A detail description can be found in chapter 3.4 "Relay board".

2.2 Features

- Integrated proximity reader.
- Integrated Ethernet controller
- Address resolution protocol to obtain host MAC address
- ICMP protocol (ping replay)
- RS232 communication port
- 1 relay output (TTL)
- 1 control input (TTL)-RFU
- Tamper switch (TTL)-RFU
- 5 LED's (red, green, 3 blue)
- Buzzer
- Two external switches to manage with control state of the device
- Possibility to place on different mounting surface (metal, wood, concrete…)
- Wall mount
- Remote functions to operate with device (over Ethernet)

2.3 Specification

CPU	8 bit microprocessor
RF Card read range	12.5cm (5'') ISO card
Card reading time	<25ms
Input/Output	1 relay output 1 tamper input (RFU) 1 TTL input (RFU)
Communication	RS232 (9600,1,N,8) 10BaseT Half Duplex
LED's	5 (red, green, 3 blue)
Power	7-10 V, 110mA
Reset	Power on Reset, WDT Reset
Mounting	Wall mount
Environment	-35°C do +85°C, 10% do 90% humidity
Dimensions	120x85x30 mm
Weight	120g
Material	ABS
Colour	Black, Bone

3. Installation

3.1 Hardware

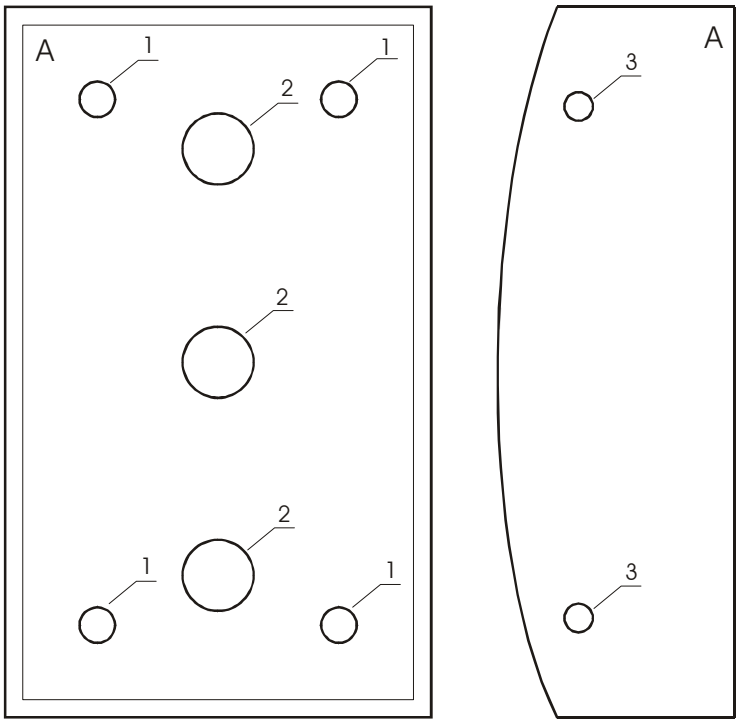


Figure 1

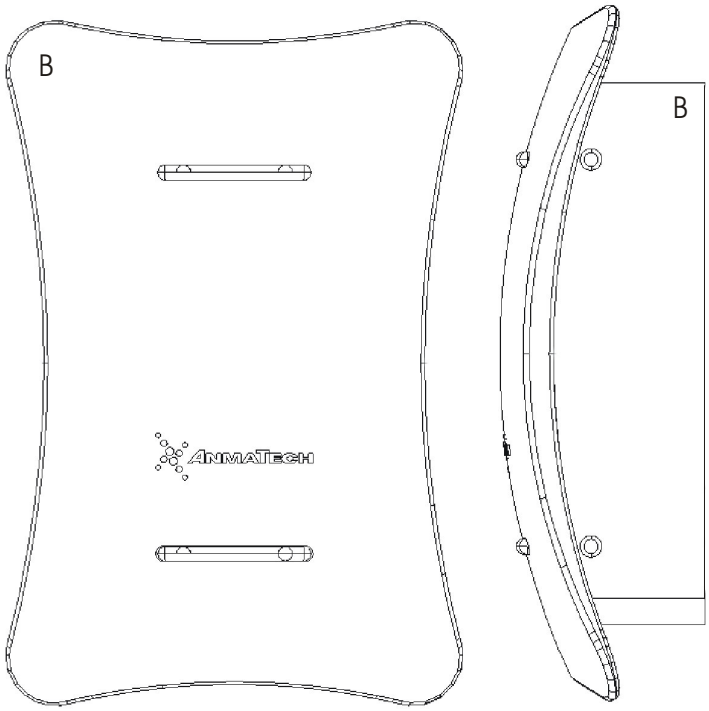


Figure 2

On the proper location of the wall drill four holes according to position 1 on the A part. Get through hole 2 power and Ethernet cable. With screws marked with number 1 fix an A part on the location. The B part put over the A part and fix it with screws marked with number 3.

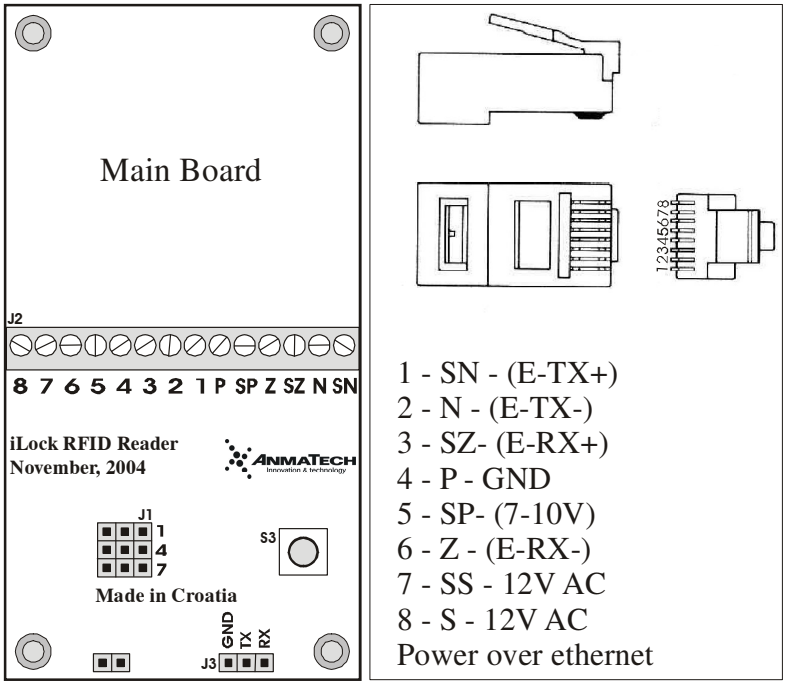


Figure 3

Connector J2:

- SN-orange wire with white band: positive differential line for transmitting data over UTP cable
- N-orange wire: negative differential line for transmitting data over UTP cable
- SZ-green wire with white band: positive differential line for receiving data over UTP cable
- Z-green wire: negative differential line for receiving data over UTP cable
- SP-blue wire with white band: 7-10V DC
- P-blue wire: common ground (GND)
- SS-brown wire with white band: 12V AC
- S-brown wire: 12V AC
- 1-white wire from relay module
- 2-red wire from relay module
- 3-tamper switch signal (TTL). High to low transition. This signal interrupts microprocessor, which sends predefined

message to server application. This signal also can be driven by external module with compatible voltage level.

- 4-GND common ground for signal 3
- 5-input (TTL). Short with pin 6 generate interrupt to microprocessor. Microprocessor then sends to server application predefined message.
- 6-GND common ground for signal 5
- 7-RS232 receive line (TTL)
- 8-RS232 transmit line (TTL)

Connector J3:
J3 is RS232 communication port for communication with PC.

- RX-RS232 receive line
- TX-RS232 transmit line
- GND-common ground

Connector J1:
Depending on J1 configuration, three modes are supported.

- 1-2 short: normal mod. In this mode proximity reader transmits card number to microprocessor. Microprocessor over Ethernet sends start packet with card number to host application. Card number can also be viewed at J2 in RS232 TTL format (pins 7, 8).
- 1-2 and 5-6 short: normal mod plus displaying card number on the screen of the Hyper Terminal, if port J3 is connected to PC.
- 1-2 and 4-5: console mod. Setting up CCR100-E10.

3.2 Power supply

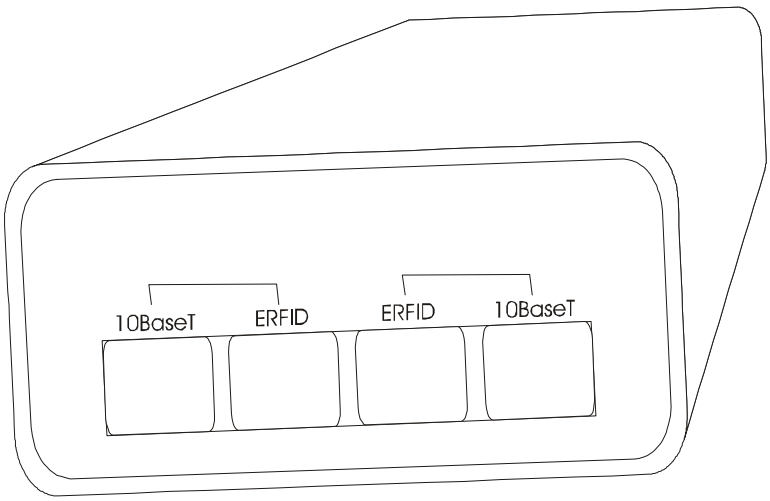


Figure 4

With this power supply it's possible to supply a couple of device. Wiring diagram find on the picture 3 above. Connect CCR100-E10 with UTP cable to RJ45 connector marked ERFID. The other connector, marked 10BaseT connect to switch (hub). Maximum supply current by the port is 1.35A (12V AC plus 7-10V DC).

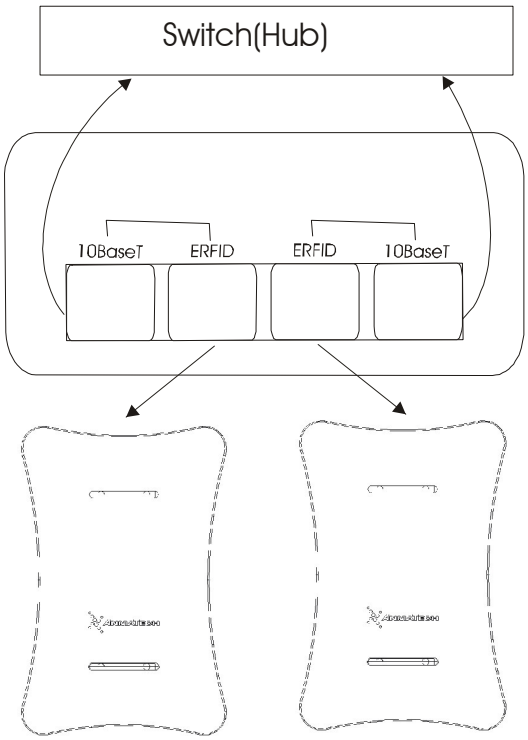


Figure 5

3.3 Software

Set CCR100-E10 in console mod. With serial cable connect CCR100-E10 to PC. Run Hyper Terminal from windows. Press "Enter" until authorisation window come out. Default username is admin and password is password.
If authorisation is correct, command prompt come out.
The following commands are supported by CCR100-E10:

- ***help*** displays supported commands.
- ***set*** displays current settings.
- ***user*** sets new username and password.
- ***exit*** exits console interface with saving changes.
- ***coding x (1-coding, 0-none)*** enables/disables coding of generated random number with key1 and key2. Enabling this flag follows entering key1 and key2.

- ***my_ip*** displays current device IP address.
- ***my_ip ip_address (xxx.xxx.xxx.xxx)*** sets new device IP address.
  Example: my_ip 192.168.0.26

- ***host_ip*** displays current host IP address.
- ***host_ip ip_adresa (xxx.xxx.xxx.xxx)*** sets new host IP address.
  Example: host_ip 192.168.0.223

- ***host_mac*** displays current host MAC address.
- ***host_mac MAC_address (6 bytes).***
  Example: host_mac 00-50-ba-b9-0e-d5

- ***mac_chk x (1-check, 0-none)*** Enables/disables host MAC address checking.
  Example: mac_chk 1

- ***gateway_ip*** displays current default gateway IP address.
- ***gateway_ip ip_adresa (xxx.xxx.xxx.xxx)*** set new default gateway IP address.
  Example: gateway_ip 192.168.0.1

- ***netmask*** displays current subnet mask.
- ***netmask netmask (xxx.xxx.xxx.xxx)*** sets new subnet mask.
  Example: netmask 255.255.255.0

- ***my_id*** displays current ID.

- ***my_id ID (xxxxxx)*** sets new ID-a.
  Example: my_id 100013

- ***udp_port*** displays source and destination UDP port.
- ***udp_port source dest*** sets UDP source and destination port.
  Example: udp_port 4950 4950

- ***ver*** Displays current program version

- ***status x*** displays or modifies control state of the device.
  x=1: Control state can be set by external switch on the front side of CCR100-E10. In UDP packet it is marked as "A" or "B" depending of the switch state.
  x=2: Control state is fixed. In UDP packet it is marked as "A"
  x=3: Control state is fixed. In UDP packet it is marked as "B"

- ***LBControl x (1-enabled, 0-disabled)*** Enables/disables LED's and buzzer control over UDP.
  Example: LBControl 1

- ***RemoteFlash x (1-enabled, 0-disabled)*** Enables/disables setting up of parameters of CCR100-E10 over UDP.
  Example: RemoteFlash 1

3.4 Relay board

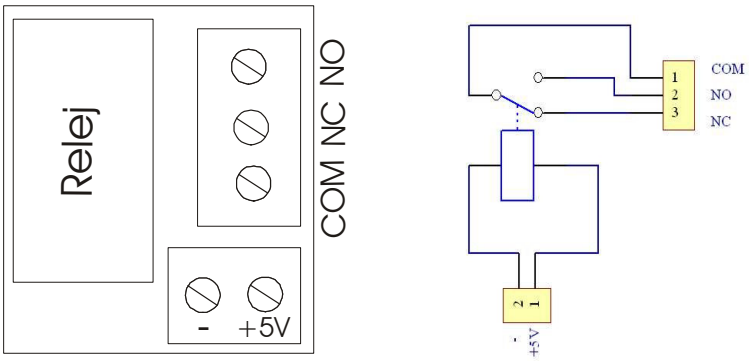


Figure 6.

Figure 6 presents block diagram of the relay board and its schematics. With two wires connect pins 1 and 2 on the CCR100-E10 board, with pins marked "-" and "+5V", respectively. Maximum current through the relay is marked on the relay.

4. Communication protocol

4.1 Start packet of CCR100-E10 to host computer

Communication path: CCR100-E10 to host computer.
Structure of data part of UDP start packet:

1	0	1	0	0	0	1	3	0	2	5	0	F	0	2	1	C	B	A	6	5	2	9

3	2	6	4	8	8	6	1	A	\0

1	0

10 Packet ID: Start packet (2 character)

1	0	0	0	1	3

100013 Unique identification number of CCR100-E10 (6 character)

0	2	5

025 Communication ID: increases every time new communication starts (3 character)

0	F	0	2	1	C	B	A	6	5

0F021CBA65 RF Card Number (10 HEX character)

2	9	3	2	6	4	8	8	6	1

2932648861
if (coding==1) Random number is coded with key 1 (10 character)
else none

A

A Control state of CCR100-E10 Two different states: A and B. Change state with external switch.

\0

\0 NULL character

4.2 LED's and buzzer control over UDP

This option is enabled by setting up an LBControl flag of CCR100-E10 in console mod.
Communication path: Host computer to CCR100-E10.
Structure of data part of UDP start packet:

1	0	1	0	0	0	1	3	1/0	0	5	0	4

1/0	0	3	1	0	1/0	0	3	1	0	1/0	0	3	1	0	\0

1	0

Packet ID: LBControl packet (2 character)

1	0	0	0	1	3

100013 Unique identification number of CCR100-E10 (6 character)

1/0	0	5	0	4

1/0 Buzzer control (1 character): 1-on, 0-off.
05 Number of beep intervals (2 character): from 01 to 99.
10 Beep time interval (2 character): from 01 to 99, 01=100ms.

1/0	0	3	1	0

1/0 Red LED control (1 character): 1-on, 0-off.
03 Number of flash intervals (2 character): If LED control==1 & value==00, LED is turned on and device waits for server to turn it off.
10 Flash interval (2 character): from 0 to 99, 01==100ms.

1/0	0	3	1	0

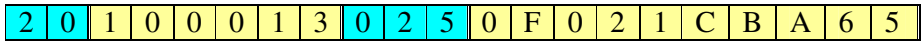
1/0 Blue LED control (1 character): 1-on, 0-off.
03 Number of flash intervals (2 character): If LED control==1 & value==00, LED is turned on and device waits for server to turn it off.
10 Flash interval (2 character): from 0 to 99, 01==100ms.

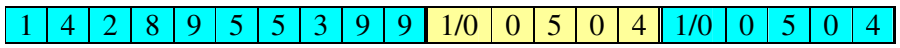
1/0	0	3	1	0

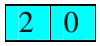
1/0 Green LED control (1 character): 1-on, 0-off.
03 Number of flash intervals (2 character): If LED control==1 & value==00, LED is turned on and device waits for server to turn it off.
10 Flash interval (2 character): from 0 to 99, 01==100ms.

4.3 Return packet of start packet

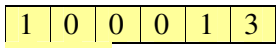
Communication path: Host computer to CCR100-E10.
Structure of data part of UDP packet:





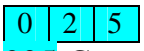


Packet ID: return packet (2 character)

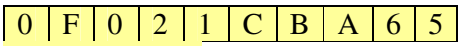


100013 Unique identification number of CCR100-E10 (6 character)

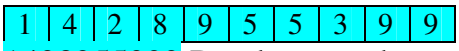
if (coding == 1) then check{



025 Communication ID: increases every time new communication starts (3 character)

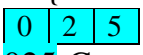


0F021CBA65 RF Card Number (10 HEX character)



1428955399 Random number coded with key 2 (10 character)

if (Relay control==1) Activate relay
if (Number of beep sounds>0 & Beep interval>0) Activate sound signal
if (LED's control==1) Turn LED's on
Erasing random number to ensure no pirate communication.
}
else {



025 Communication ID: increases every time new communication starts (3 character)
if (Relay control==1) Activate relay
if (Number of beep sounds>0 & Beep interval>0) Activate sound signal
if (LED's control==1) Turn LED's on
}

1/0	0	5	0	4

1/0 Buzzer control (1 character): 1-on, 0-off.
05 Number of beep intervals (2 character): from 01 to 99.
10 Beep time interval (2 character): from 01 to 99, 01=100ms.

1/0	0	5	0	4

1/0 Relay control: 1-activate, 0-none (1 character)
05 Number of relay active time intervals (2 characters): from 01 to 99
04 Relay active time interval (2 characters): from 0 to 99, 01=100ms. If value==00 relay is activated and device waits for server to turn it off.

1/0	0	3	1	0

1/0 Red LED control (1 character): 1-on, 0-off.
03 Number of flash intervals (2 character): If LED control==1 & value==00, LED is turned on and device waits for server to turn it off.
10 Flash interval (2 character): from 0 to 99, 01==100ms.

1/0	0	3	1	0

1/0 Blue LED control (1 character): 1-on, 0-off.
03 Number of flash intervals (2 character): If LED control==1 & value==00, LED is turned on and device waits for server to turn it off.
10 Flash interval (2 character): from 0 to 99, 01==100ms.

1/0	0	3	1	0

1/0 Green LED control (1 character): 1-on, 0-off.
03 Number of flash intervals (2 character): If LED control==1 & value==00, LED is turned on and device waits for server to turn it off.
10 Flash interval (2 character): from 0 to 99, 01==100ms.

1

1 1-replay packet to sender as ACK with the same data, 0-none (1 character)

\0 NULL character

4.4 Start packet initialisation with last number reed

Communication path: Host computer to CCR100-E10.
Structure of data part of UDP packet:

3	0	1	0	0	0	1	3	1/0	\0

3	0

30 Packet ID: Start packet initialisation (2 character)

1	0	0	0	1	3

100013 Unique identification number of CCR100-E10 (6 character)

1/0

1/0 1-Replays start packet to sender, 0-forwards start packet to host computer (1 character)

\0

\0 NULL character

4.4 Source code for coding random number

```
void shift(unsigned char *randnum, unsigned char *key){
  xdata unsigned long int temprandnum, tempkey;

  temprandnum=atol(randnum);
  tempkey=atol(key);
  temprandnum^=tempkey;
  ConvertToString(temprandnum,randnum);
}
```

Function *shift()* accepts two parameters: randnum as string and key as string. *Randnum* is a random number generated by the CCR100-E10 and *key* is the number for coding random number with. Function *atol()* converts string to long. Random number is XORed with the key1. At the end coded random number is back converted to string and send by UDP packet to host computer. Host computer decode this random number with key1 in the same manner. After processing received packet it returns packet with random number coded with key2. The CCR100-E10 will check this key2 only if the ”coding” flag is enabled.

4.5 Setting up parameters of CCR100-E10 over UDP

This option is enabled by setting up a RemoteFlash flag of CCR100-E10. This flag can be set only in console mod, but cleared over UDP packet. Structure of the data part of the UDP packet is shown below. Hole packet must be implemented. It is very important to note that length of field is fixed. For example: if you want to change only one parameter, the other parameters must be included in the packet.
Communication path: Host computer to CCR100-E10

Packet ID	My ID	Username	Password	My IP	Host IP	Gateway IP

Netmask	My ID	Username	Password	UDP source port	UDP dest port

Status	Host MAC	MAC CHK	Coding	Key1	Key2	LBC	RF	\0

Field description:

Packet ID (2 character): It defines type of packet. Packet ID is “40”.
My ID (6 characters): Used to login to CCR100-E10.
Username (10 characters): Used to login to CCR100-E10. Length of this field is fixed. If length of the username is less then 10 characters place NULL character to fulfil a field.
Password (10 characters): Used to login to CCR100-E10. Length of this field is fixed. If length of the password is less then 10 characters place NULL character to fulfil a field.
My IP (5 bytes): New IP address of the CCR100-E10. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least four bytes are the new IP address.
Host IP (5 bytes): New Host computer IP address. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least four bytes are the IP address.
Gateway IP (5 bytes): New gateway IP address. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least four bytes are the IP address.
Netmask (5 bytes): New subnet address. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least four bytes are the subnet address.
My ID (7 characters): New unique identification number of CCR100-E10. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least six characters are the ID number.

Username (11 character): New username to login to CCR100-E10. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least ten characters are the username. Length of this field is fixed. If length of the username is less then 10 characters place NULL character to fulfil a field.
Password (11 character): New password to login to CCR100-E10. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least ten characters are the password. Length of this field is fixed. If length of the password is less then 10 characters place NULL character to fulfil a field.
UDP source port (3 bytes): New UDP source port. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least two bytes are the port number. First byte is the high byte of the source port number, and the second byte is the low byte of the source port number.
UDP dest port (3 bytes): New UDP destination port. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least two characters are the port number. First byte is the high byte of the destination port number, and the second byte is the low byte of the destination port number.
Status (2 character): Enables/disables “status” flag. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least character is the new Status flag.
Host MAC (7 bytes): New MAC address of the host computer. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least six bytes are the new HOST_MAC address.
MAC CHK (2 character): Enables/disables “mac_chk” flag. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least character is the new MAC_CHK flag.
Coding (2 character): Enables/disables “coding” flag. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least character is the new Coding flag. It is not allowed to disable coding flag remotely.
Key1 (11 characters): New key1 to code random number. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least ten characters are the new Key1 number.
Key2 (11 characters): New key2 to code random number. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least ten characters are the new Key2 number.
LBC (2 character): Enables/disables “LBControl” flag. First byte is a character, which defines the action (‘1’-change settings, ‘0’-none). Least character is the new LBControl flag.

RF (2 character): Enables/disables "RemoteFlash" flag. First byte is a character, which defines the action ('1'-change settings, '0'-none). Least character is the new RemoteFlash flag.

4.6 Tamper switch and it's functionality (Reserved for future use)

As a part of safety, a tamper switch has been integrated into CCR100-E10. Its basic function is to alarm if someone try to remove it from its mounting surface. After power on tamper switch is locked. If tamper switch is not used it is possible to connect external switch (connector J2, pin 3 and 4) which will control another event. Under console mode it is possible to enable or disable this option by setting on or off "Tamper" flag. Also it is possible to set up message, which will be send to host computer after tamper switch is released.