CRS 40 V3

INSTALLATION, OPERATION AND SERVICE MANUAL

APATOR METRA s.r.o.
Havlíčkova 919/24
787 01 Šumperk
Czech Republic

tel.: +420 583 718
e-mail: prodej@metra-su.cz
www: http://www.metra-su.cz

TABLE OF CONTENTS

1 Introduction 4
1.1 System conception 4
1.2 System topology for units A and B 4
1.3 System typology for unit V3 COMBI 5
1.4 Advantages of the system 6
2 Safety 7
2.1 Safety notice 7
2.2 Requirements for workers performing installation, maintenance and operation of the system 7
2.2.1 Personnel involved with installation and maintenance 7
2.2.2 Operation of equipment 7
3 Description of the equipment 9
3.1 General description of the equipment 9
3.1.1 Unit type A (collecting unit, the concentrator) 9
3.1.2 Unit type B (control unit, coordinator) 10
3.1.2.1 Type B Combi unit (control unit with integrated concentrator unit) 11
3.2 Technical information 11
3.3 Packet content 12
3.4 Internet connection options 12
3.5 Options of data transmission from reading networks 13
3.6 Types of data files 13
3.7 Method of use or disposal 13
4 Spreading of radio waves 14
4.1 Propagation of electromagnetic fields 14
4.2 Possible obstacles to propagation of the electromagnetic waves in the apartment building 14
5 Installation in the apartment house 15
5.1 Installation of control unit B 15
5.2 Installation of collecting units A 16
5.3 Finishing and verifying of the installation 17
5.4 Diagnostics of connected units 18
6 Reading network 19
6.1 RF MAC Reading network address 19
6.2 Configuration of protocol 20
6.3 Configuration of multiple overlapping network 21
7 Firmware updates 23
7.1.1 Check/show of firmware version and firmware of radio module 23
7.2 Update/upgrade unit B software 23
8 Troubleshooting 24
9 Connecting to the readout network 26
9.1 VPN network structure 26
9.2 VPN connectivity options 27
9.2.1 Connection via PC 27

9.2.1.1 Integrated Microsoft Windows client 27
9.2.1.2 Windows 11 VPN client 32
9.2.2 Connecting via mobile device 39
9.2.2.1 Android operating system 39
9.2.2.2 System iOS 42
10 Description of the graphical interface 43
10.1 Connection to the reading network 43
10.2 Login to the reading network 43
10.3 Reading network Home page 44
10.3.1 Home page 44
10.3.1.1 Reading status 44
10.3.1.2 System status 44
10.3.1.3 Overview table 45
10.4 Reading network status 45
10.5 Setting network parameters 46
10.5.1 Basic settings 46
10.5.2 Connection settings 47
10.5.3 Reading plan, authorisation keys and base of plan 47
10.5.4 Update/upgrade software 47
10.5.5 Access settings 47
10.5.6 Servis functions 48
11 For the advanced 49
11.1 Basic synchronization settings 49
11.2 Advanced synchronization settings 52
12 Solutions to the most common user problems 53
13 Assembly regulation 54
13.1 General recommendations 54
13.2 Structural system T0XB 54

1 INTRODUCTION

The central readings CRS 40 V3 is used for wireless reading of data transmitted by radio heat cost indicators E-ITN 30, E-ITN 40 and radio modules for water meters E-RM 30. The system is wireless, so except for the power supply of 230 V (and possible connection to the Internet), its installation does not require any cables.

CRS 40 V3 is not backward compatible to V2! (Units V3 and V2 can't be combined!)

1.1 SYSTEM CONCEPTION

The system requires minimal user intervention. In normal operation, it processes and stores data by itself. In case of a problem, the system will send an e-mail for its immediate solution. Data can also be automatically backed up to your computer. It is possible to use a secure connection with an SFTP server that you can operate yourself, or you can use the services of Apator Metra. All day-to-day data form your CRS 40 V3 systems is available on the SFTP server, and thanks to access to it, the units can be easily and collectively or individually reconfigured of necessary. All units can connect to the server daily to upload new data and download any configuration files, based on which they are automatically reconfigured according to your requirements at the end of the day.

No matter which option you choose for working with data from CRS 40 units, fully automatic updates from both manufacturer and the publisher of the Linux operating system are a matter of course, so that all currently known security requirements.

1.2 SYSTEM TOPOLOGY FOR UNITS A AND B

The reading network consists of one control Unit B V3 and several collecting Units A V3. These units are automatically configured in a wireless network with a star topology during installation. Each unit has a direct radio contact with the controlling Unit B. It controls the communication on the entire reading network, stores and processes the acquired data.

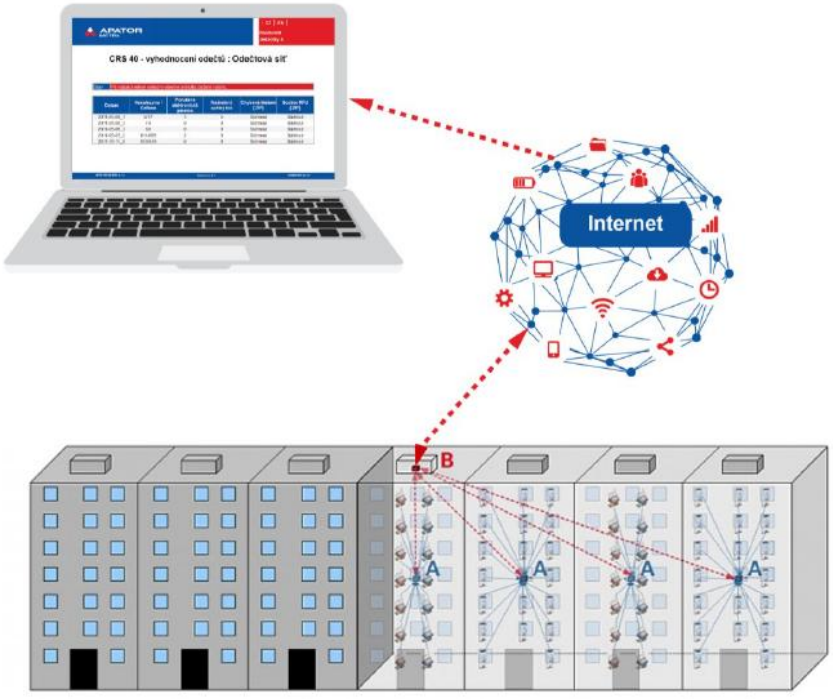


Figure 1: Diagram of the central readings CRS 10 V3

1.3 SYSTEM TYPOLOGY FOR UNIT V3 COMBI

Reading network consists only of one unit B Combi that does not use any collecting Units A. Its advantage are lower costs and faster installation. Biggest advantage is continuous reading compared to standard system CRS 40 V2 that utilizes Units A that had to adhere to limits for radio transmission in its radio range, that means they cannot transfer data to Unit B. Disadvantage of system Combi is a bit worse range – maximum of 1 entrance (6 – 8 floors) or 2 entrances (4 floors) considering it will be installed in the middle of radio area.

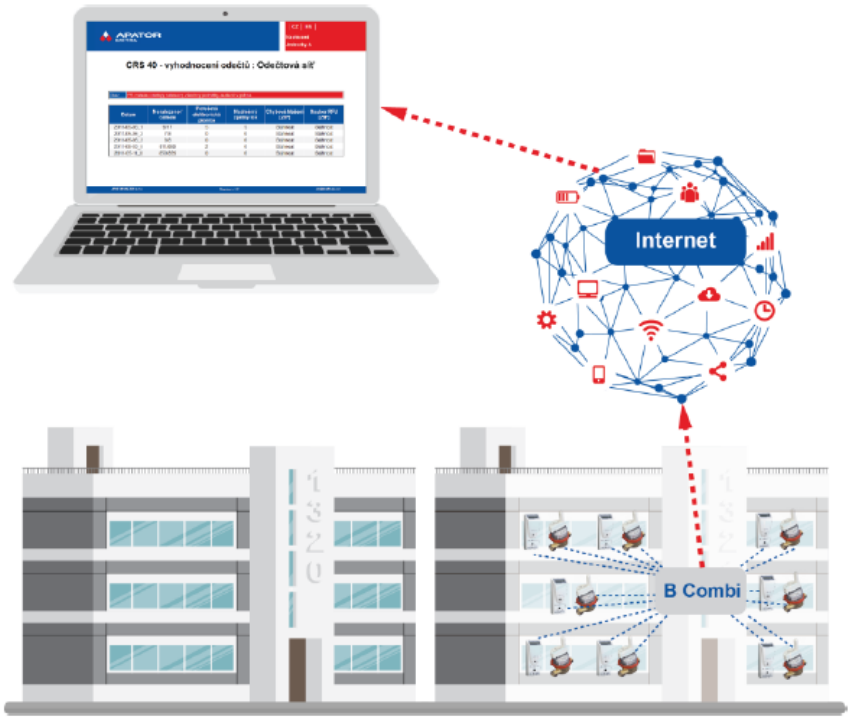


Figure 2: Diagram of the central readings CRS 40 V3 Combi unit

1.4 ADVANTAGES OF THE SYSTEM

The biggest problem during the process of heat cost or water consumption billing can be incomplete data as ratio is calculated. This can be caused by meter or allocator manipulation, its intentional damage or failure. Situation is also complicated in prices of energy or water during the year. Another problem can arise when people move and forget to record the consumption. Time consuming inter-readings or consumption estimation must be made from these reasons in order to determine the values at specified date. Billing company risks the reclamations and conflicts with flat users.

Thanks to the installation of Central reading system, you can get the information about heat and water consumption every day in a year. Any errors or manipulations is quickly identified and effective correction can be made. Also reduction of number of manipulations can be expected – tenants will learn that their unauthorized handling are quickly revealed and brings nothing to them, only payment of service cost to put heat cost allocators and water meters back to perfect condition.

You can also offer to your customers additional statistics and information about consumption due to big amount of actual data. Many problems (connected e.g. with excessive consumption) can be solved already during billing period.

2 SAFETY

2.1 SAFETY NOTICE

This manual contains information important for proper and safe use of this equipment.

Read the manual carefully before you start working with the equipment. Above all, pay attention to the safety precautions mentioned in the manual. The manufacturer holds no responsibility for any damage caused by using the product in contradiction herewith.

2.2 REQUIREMENTS FOR WORKERS PERFORMING INSTALLATION, MAINTENANCE AND OPERATION OF THE SYSTEM

When working with the equipment, it must be discerned between the staff assigned to work directly with the device. Either during assembly, installation or service, and between staff that only processes data from the device and accessing them via a remote connection. Before plugging in the charging cord to microprocessor, make sure to plug in backup battery first.

2.2.1 Personnel involved with installation and maintenance

During installation and maintenance of equipment, the workers come into contact with electrical equipment with voltages up to 230 V. Connecting to the electrical circuit or maintenance work may only be performed by a qualified electrician in accordance with § 6 of Decree no. 50/1978 (CR), or with relevant legislative in the respective country.

Installed elements are radio equipment in an industrial 868 MHz band. Staff should be familiar with the legislative and practical use of this band. Also, they should have at least basic understanding of the functioning of wireless devices.

Personnel performing the installation must be trained by the manufacturer in the installation and placement of elements of the central reading system CRS 40.

Staff must have a basic PC skills (setting IP addresses, work with Internet browsers) and familiar with the functioning of the Internet (IP addressing system, the operating principle of the private network connection settings via Ethernet, Wi-Fi, GSM/GRPS).

2.2.2 Operation of equipment

The operator is a person who processes the data and accesses the device from a remote computer over the Internet. Maintenance of equipment contribute significantly to the correct settings of the device, which is essential for trouble-free operation and proper collection and interpretation of data.

The operator must be able to work with the PC at least at the ordinary user level. Workers performing computer settings for working with distant reading network should also be familiar with the functioning of the Internet (IP addressing system, the operating principle of private networks, work with e-mail).

Operators should be trained in working with the system of central readings CRS 40.

INSTALLATION AND SERVICE

3 DESCRIPTION OF THE EQUIPMENT

3.1 GENERAL DESCRIPTION OF THE EQUIPMENT

CRS 40 is a system for centralized remote reading of radio heat cost allocators (E-ITN 30, E-ITN 40) and radio modules for water meters (E-RM 30) operating in the 868 MHz ISM band and for devices supporting Wireless M-BUS, which transmit in the protocol T1 and C1. Reading network consists of one or more collecting units A (concentrator) and one central unit B (coordinator) for coordinating meter reading networks and sending data over the Internet (Ethernet, optional Wi-Fi or GSM) to the remote operator. The control unit B or B Combi also serves to adjust the readings (error messages, schedule of readings and possibly base plan). All elements of the meter reading networks communicate via wireless network. Units of the reading network are powered from the network of low voltage of 230 V. The readings of heat cost allocators and radio water meters are performed with daily periodicity. Users log into the system from personal computer or mobile device via an encrypted connection using a simple web GUI. The automatic transfer of data from the meter reading network can be done using e-mail, SFTP or a script. CRS 40 is designed for indoor environment (installation in residential buildings).

3.1.1 Unit type A (collecting unit, the concentrator)

A unit is designed to collect data from radio transmitting devices (heat cost allocators and radio modules) and have them forwarded to the control unit B. Unit B (coordinator) further evaluates the data, stores and transmits possibly over the Internet. Unit A consists of a plastic box, power supply (NZCC1101), radio module (RFCC1101) and panel antennas attached from the inner side to the cover box.

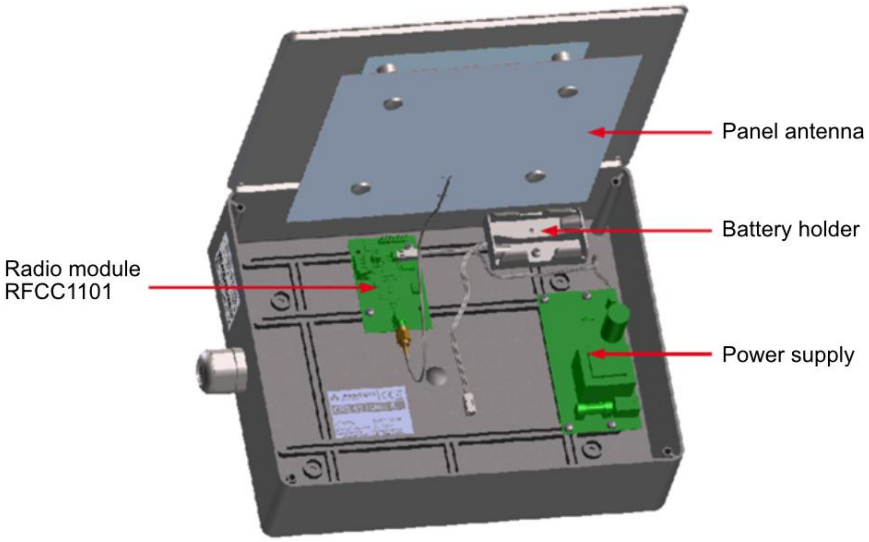


Figure 3: Schematic of unit A

3.1.2 Unit type B (control unit, coordinator)

The control unit B manages a group of A units, receives data, evaluates, stores and eventually sends via the Internet. Unit B consist of a box, power supply (adapter), radio module (RFCC1101), panel antenna mounted on the inner side of the lid and module box miniature computers (OLIMEX A20)

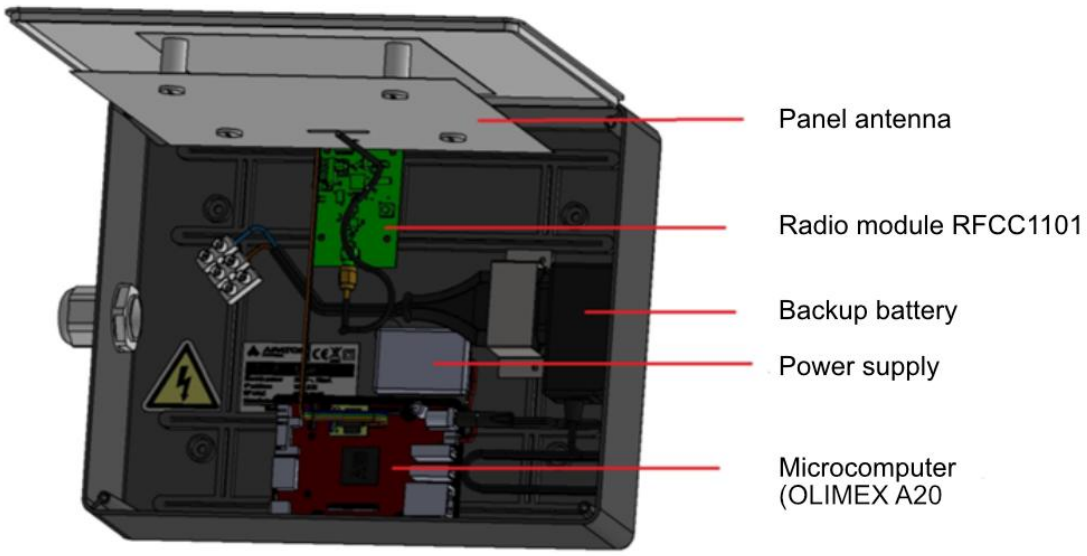


Figure 4: Schematics of CRS unit B

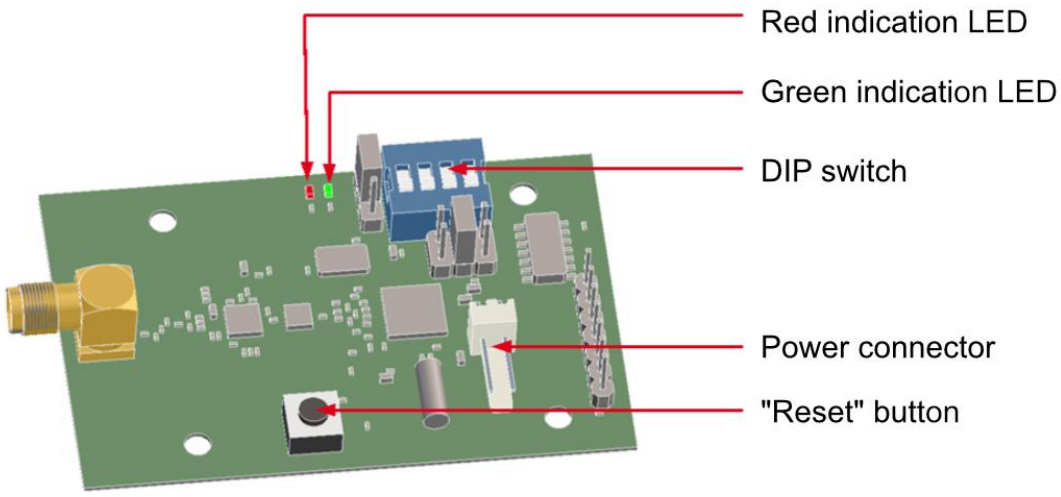


Figure 5: Schematic of the radio module RFCC1101

3.1.2.1 Type B Combi unit (control unit with integrated concentrator unit)

The B combi is a control unit that allows readings without auxiliary units A. It is therefore intended for smaller objects that can be read by a single unit. The unit can be remotely connected to the Internet in the same way as the standard unit B.

3.2 TECHNICAL INFORMATION

Frequency range ISM 868 MHz: Frequency modulation Power Duty cycle	 869.525 MHz 18 dBm <5%
Antenna	integrated
Transmission protocol	Metra, Wireless M-Buss
Possible number of radio devices (E-ITN 40, E-ITN 30, E-RM 30) per one unit A	All n the radio range (approx. 350 units)
Max. quantity of a Units in A in one reading network (per one unit B)	max. 10
Number of overlapping networks	max. 15
Power supply: Unit A Unit B Unit B COMBI	230 V / 30 mA / 50 Hz 230 V / 30 mA / 50 Hz 230 V / 30 mA / 50 Hz
Recommended power supply cable	Two-core H03VVH2-F 2X0,75 C Three-core H03VV-F 3G0,75 CE Note: connecting of the power supply NZCC1101 to the 230 V is protected with one fuse. Order of wires must be as on the label N, L (L is protected)
Recommended batteries (unit A – for installation)	Alkaline batteries, type AA, 1,5V Note: batteries must be removed before connecting unit A to the mains 230 V power supply
Ingress protection	IP 40
Environment	Intended for indoor use
Operation environment	0 – 40°C / rel. humidity <65%
Data output (unit type B)	RJ45 (Ethernet), or via Wi-Fi or GSM
Data quantity	Approx. 50 MB / month (only includes meter reading network connection and sending information via e-mail, direct access to the UI depends on the amount of data transferred)
Supported browsers (for work with GUI)	Mozilla Firefox 7.0 or higher Google Chrome 15.0 or higher

3.3 PACKET CONTENT

Before sending all units of central readings CRS 40 inspected at the factory. Upon receipt, please check the integrity and completeness. In the event of damage to the units immediately contact the transport company or the manufacturer.

3.4 INTERNET CONNECTION OPTIONS

To make of the advantages of central reading system CRS 40, it is necessary to connect the reading network to the Internet. The CRS unit B therefore contains an integrated standard RJ45 Ethernet interface. Using this interface, it can be connected directly into the domestic cabling structure (type CAT5 or higher - cable with RJ45 connector). It is also possible to use a Wi-Fi USB power adapter or GSM modem.

The control unit B waits for assignment of the dynamic IP address V4 through protocol DHCP, which is commonly used for this purpose. When the unit is required to use the address assigned by the Internet provider, it must be specified in the Settings.

Possible means of connecting to the Internet:

- via Ethernet network
- via Wi¬ Fi network (Wi¬ Fi USB adaptor must be used)
- via mobile network (USB GSM modem must be used)

Using various connection methods depends on the circumstances of a particular apartment building. If in doubt, contact your Internet provider.

If the computer is correctly connected to the Internet and set up, it automatically initiates an encrypted connection and allows connection with the control computer.

For more information, see chapter 5.1. Installing the unit B.

Cooperation of unit B has been tested with following modems:

Huawei E3372

Huawei E303

Huawei E173

Huawei 3531

ZTE MF821D

Tested USB Wi-Fi adapters:

MOD-WIFI-AR9271

MOD-WIFI-AR9271-ANT

MOD-WIFI-R5370

MOD-WIFI-R5370-ANT

MOD-WIFI-RTL8188

MOD-WIFI-RTL8188ETV

Note: These are USB adapters supplied by manufacturer of microcomputer Olimex (http://www.olimex.com)

Note: For connection CRS 40 with modem we recommend using SIM card supporting 4G/ LTE. Otherwise connection problems may occur.

3.5 OPTIONS OF DATA TRANSMISSION FROM READING NETWORKS

Readings is possible to download after sign in to web interface of B Unit. In addition, system allows following automatic data transmission:

1. Sending to e-mail. On you e-mail address you will receive info e-mail every day with results of readings. Data are saved in a TXT format. Readings in TXT format can be downloaded anytime from page with readings in ZIP archive. E-mail will be send also in case system detects some service information or an error. For service information or error are considered following states: unit has not been read for a given number of days, broken seal, back flow larger than set value. Error reports are send in standard HTML format for internet browser and in ZIP archive. We recommend to pay attention to these reports. It is advised to send these reports to another e-mail address than everyday readings. Error reports and service information can be viewed on page with readings results or download them in ZIP archive. To configuration tool was added option to add multiple e-mails (separated by a semicolon).
2. Copy data to SFTP server: Data are copied using secured connection to server. More information in section 10.5.1 Basic settings in setting up SFTP server.
3. Synchronization (downloading) data using a script: In this case are data copied using secure connection to customer's computer. More information in 11.1 Synchronization (backup) of data from B units.

3.6 TYPES OF DATA FILES

Generated and received CRS 40 V3 files in formats:

- **.rfu.txt**
- **.rfu-nip.txt**
- **.oms.csv**
- **.csv**
- **.json**
- **.pl**
- **.auth**

Error report – files in JSON format, contain overviews of unfound, unread, unauthorized units, units where reverse flow is detected and other possible errors.

3.7 METHOD OF USE OR DISPOSAL

”This device is subjected to a special waste handling regulation according to the Waste Act, as amended”

4 SPREADING OF RADIO WAVES

Central reading system 40 CRS works with wireless data transmission using radio waves. For proper installation and operation of the system it is helpful to learn at least the basics of radio wave spreading.

4.1 PROPAGATION OF ELECTROMAGNETIC FIELDS

In physics, electromagnetic radiation (EM radiation or EMR) refers to the waves of the electromagnetic field, propagating (radiating) through space The speed of these waves in the air is close the speed of light. Characteristic quantity is wavelength, which is approx. 35 cm at 868 MHz frequency.

Wave can band around obstacles in its way only when its wavelength is much bigger that the size of the obstacle. Reflection and refraction happens Reflection and refraction of waves occurs at the interface between two dielectric permittivity different environments. Part of the waves reflects, part breaks. The angle of reflection equals to the angle of incidence. The reflection occurs even on perfectly conductive surface (metal) because the electromagnetic radiation does not propagates in it.

In the structure of the apartment house there is a large quantity of various obstacles that have negative effect on propagation of electromagnetic waves. It is especially any metals (arming, elevator shafts, railings, metal foils etc.) through which the electromagnetic waves do not pass, only reflects. Also, the construction of buildings (walls, ceilings) significantly dampens the electromagnetic waves. Therefore, the propagation of the electromagnetic walls in such buildings is rather complicated and is individual for each building.

4.2 POSSIBLE OBSTACLES TO PROPAGATION OF THE ELECTROMAGNETIC WAVES IN THE APARTMENT BUILDING

The number and placement of the repeater units must be adjusted individually for each object. Most common obstacles are the following:

- Wired elevator shafts
- Metal sheets
- Metallic layer on windows
- Aluminum blinds
- Metal furnishing
- Large parts of furniture
- Shielding caused by electrical appliances (TV, audio, washing machine, dishwasher …)
- Equipment working permanently in 868 MHz range (baby monitor, weather station)
- Radio hobbyist

5 INSTALLATION IN THE APARTMENT HOUSE

As the radio signal spreading inside the residential building depends on many factors (see chapter 4: Spreading of radio waves), the radio contact with more distant devices is largely random and can not be predicted completely n advance. For this reason, we recommend to install the system in the period of more frequent transmission of read devices. It is the month following the beginning of billing period (once per year) in year versions, or first three days after beginning of billing period day (every month) in month versions.
The radio signal range of the radio modules for water meters is considerably larger than that of heat cost allocators. If the billing period is different for radio modules and heat cost allocators, we recommend to follow the billing period of heat cost allocators.
When installing the system outside of the period of more frequent transmission, installation verification (i.e. receiving the data from all heat cost allocators/radio modules) will probably take a longer time. Installation duration can't be calculated in advanced. The best choice is to make a "test" installation for every building type where you can find out the best location of collecting units to cover the whole building.
The installation duration should be similar in similar buildings. For recommended installation positions in the most common types of building, see chapter 12. Installation methods.

5.1 INSTALLATION OF CONTROL UNIT B

At first, find a suitable place for unit B installation (with connection to the Internet and power supply). As the unit B contains communication software and it is used also for the saving of read data, it is recommended to install it in the secured place (without the risk of theft). The control unit B must be also in the radio range of all collecting units A. For recommended installation positions in the most common types of buildings, see chapter 12. Installation methods.
Connect unit B via Ethernet cable to laptop. IP address of this laptop must be set to 169.254.123.x and the net mask to 255.255.255.0 (see your operating system manual for more information how to set it). Then connect to unit B using standard web browser – just enter IP address 169.254.123.123 to address line. Set the basic parameters for remote access in <Settings> - mainly the reading network name, login and password. It is recommended to load the reading plan (necessary for system work) also in this moment. For more information, see chapter 10. Description of graphic user interface.
Connect the unit B using Ethernet cable (RJ45 connector) directly to the Internet in residential building, to GPRS/3G router, Wi-Fi appliance or ADSL modem. It is suitable to connect GSM modem to USB port closer to the ethernet port. The unit B expects automatic allocation of IP address and other network configuration from local DHCP server. Allocated IP address may not be public. Static IP address – if used – must be entered in Settings (see chapter 10.5 Setting of system parameters). Connection to Internet is finished now. Contact your Internet provider for details of Internet access.
Mount the unit to desired place..

Warning!

Manipulate with open unit only (e.g. installation on ceiling) when the power supply is off. Othrewise the electronic components can be damaged

Warning!

Before plugging in the charging cord to microprocessor, make sure to plug in backup battery first.

Connect the unit to electric. Connection of device of electrical power network or its maintenance can be done only by staff qualified in accordance with local legislation.

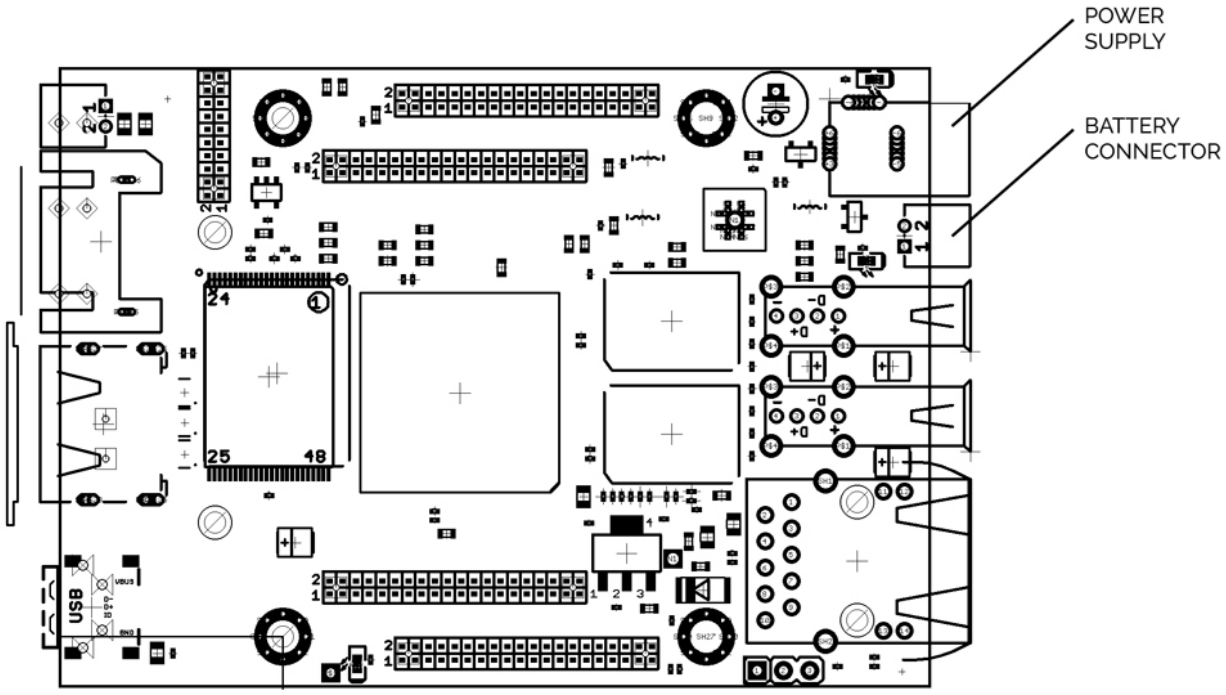


Table 1: LED signalization of operational states of control unit B

RED (OLIMEX A20)	Shines	Unit B is connected to power supply
GREEN (OLIMEX A20)	Flashes	Unit is working
YELLOW (OLIMEX A20)	Shines	Charging of the backup battery
RED (radio module)	Shines	Radio module RFCC1101
GREEN (radio module)	Flashes	Obtaining data from the units A

5.2 INSTALLATION OF COLLECTING UNITS A

It is recommended to place one colleting unit A to every entrance of residential building. Theoretically, the building can be covered with smaller quantity of collecting units. There can be a problem to read the data form some rad devices (radio modules for water meters and heat cost allocators) in such case. As a result, the read device can be interpreted as missing even when it is okay and functional.

For more information about recommended installation positions in the most common types of buildings, see chapter 13. Installation methods.

Connection of collecting unit A to control unit V must be verified at the installation site (indicated by red LED switching off on the radio module RFCC1101 after power supply connection). It is also recommended that units A receives the data from read devices (radio modules, heat cost allocator)- Data receiving is indicated by green LED blinking (approx. 1 min).

If collecting unit A is not connected to control unit B after power supply connection, try to restart unit A using Reset button on the radio module printed circuit board (see Figure 5: Schematic of the radio module RFCC1101)

After the actual installation of units A, it is appropriate to connect to unit B and verify successful communication. Click to <Units A> link on main page. Here you can find the list of connected collection units A, including the time from last communication with control unit B, signal strength and number of connections. Fore more information, see chapter 10.4 List of units A connected to reading network.

Note:

Units A are equipped with battery supply for the installation purposes (finding the ideal location and coverage verification). Battery supply is only intended for installation and once the installation is finished, it should be connected to the mains. The time required for coverage verification may be different in each object and cannot be calculated in advanced.

Note:

Before the installation of the A units, please check that the DIP switch is set the same on the B unit and all A units in one reading network (see Figure 5: Schematic of the radio module RFCC1101). For more information, please check chapter 6.3 Configuration of multiple overlapping networks.

Table 2: LED signalization of the operation states of the receiving unit B (LED on the radio module of the UNIT

RED	Shines	Unit switched on (after connecting the power supply or after restart) Communication with control unit B is not established
RED	Switch	Communication with the control unit B established
GREEN	Flashes	Reading data from the devices

5.3 FINISHING AND VERIFYING OF THE INSTALLATION

After finishing the installation of units A and B, it is necessary to verify the correct function of reading network. This can be done either at installation place using lapop connected directly to unit B or at office using Internet connection (if you have already set access rights during unit B installation).

First, you should finish the setting. Set the NTP server that serves for exact time acquiring. Then, it is essential to load the reading plan. If you upload a new plan to unit B, system is restarted automatically and starts to check the read devices readability. We recommend to load also base of plan for easier orientation in reports.

For more information about setting, see chapter Setting of system parameters.

First step of system is reading network time synchronization. Control unit B tries to connect the set NTP server and to get the exact time. If the NTP server is not set or set incorrectly, the system tries to connect to some public NTP servers that are set in software by default. If the time is not obtained from NTP server (can be caused by disconnection of unit B from Internet, or by blocking of some ports by provider), unit B get the time from radio packets transmitted by heat cost allocators and radio modules. This way of time synchronization is less exact and it takes a longer time.

During the time synchronization you can get the exact information by clicking to <log> link. The displayed messages are intended for service purpose only.

Figure 6: Time synchronization of the reading network

When installation verification is finished, unit B starts to receiving via units A the data from heat cost allocators and radio modules for water meters. This data are compared with reading plan (i.e. list of devices installed in particular building). You can watch the installation progress in a table (Figure 7: Installation progress). You can also open the list of devices that are already read or still not read by clicking to blue numbers.

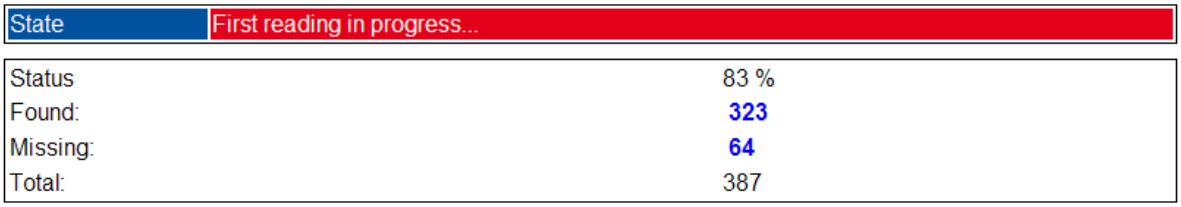


Figure 7: Installation progress

The time required for installation verification can be different based on the building type and its parameters and can't be calculated in advance. Generally, two different situations can occur:

1. Received data are complete, it means all allocators and radio modules for water meters were read. Units A can be fasten to the finally place using 4 screws and wall plugs. Disconnect the batteries and connect the unit A to electrical network 230 V. Note: Connection of power supply NZCC1101 to electrical power network is secured by one fuse, connection of wires according to label (N,L) must be kept (L is secured). Connection of device to electrical power network or its maintenance can be done only by staff qualified in accordance with local legislation.
2. System does not find all read devices from reading plan. To solve the situation, proceed step by step and find the cause:
    a. Check the plan first, i.e. if all mentioned units are really installed and repair the reading plan if necessary. If some read devices should be removed from reading plan, you can add them to "List of ignored read devices"
    b. Check if the missing devices really transmit the data. The best way how to do it is to use mobile reading unit RFU 40 with panel antenna to make reading form another place. If you can read heat cost allocator or radio module for water meter using RFU 40, try to find new position for unit A. After change of unit A location, restart unit B (by new upload of reading plan). If heat cost allocators or radio modules for water meters can't be rad even with mobile radio reading unit RFU 40, it is necessary to check it on site.

5.4 DIAGNOSTICS OF CONNECTED UNITS

It is the most important tool to analyse and correctly install in a house. Using export of data to Excel and following analysis it is possible to optimalize unit placement in a house.

You can see unit in real time on page Network statistics. User has a possibility to show read allocators up to 24 hours ago and to sort by serial number, unique number and signal strength.

Reading network

6 READING NETWORK

6.1 RF MAC READING NETWORK ADDRESS

Every produced unit of Central reading system CRS 40 is equipped with unique identification number of radio module RFCC1101, so called RF MAC address. You can find this number on unit identification label. First two groups of digits are unique for particular customer, next two identify unit.

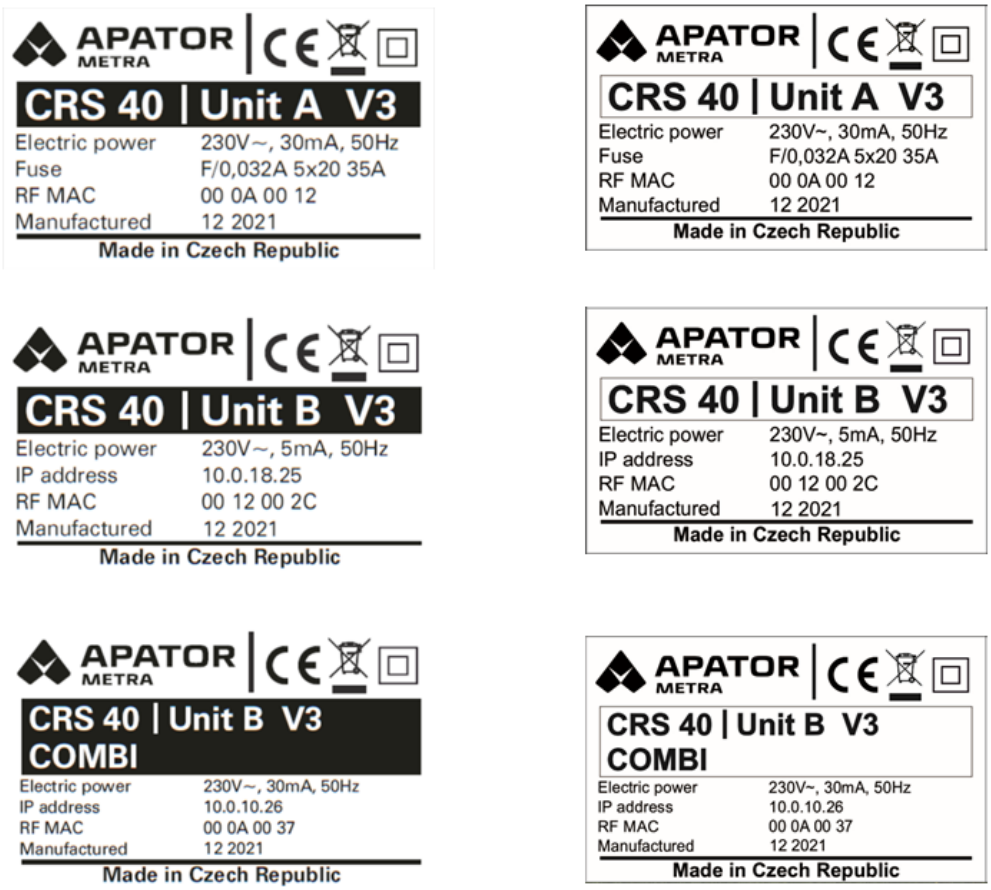


Figure 8: Identification label of the units B

There can be situations, when more billing companies provide their services in one housing estate (or even in one large building). To avoid situations like that e.g. unit A of one bulling company would connect to reading network of another one, sameness of first two groups of digits is checked during connection establishment.

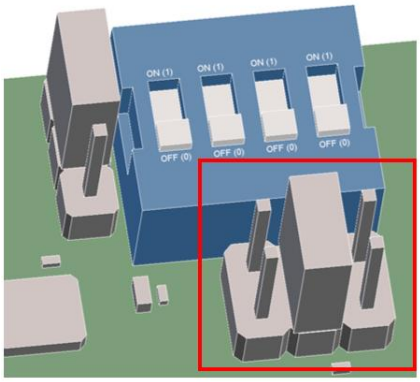
Warning

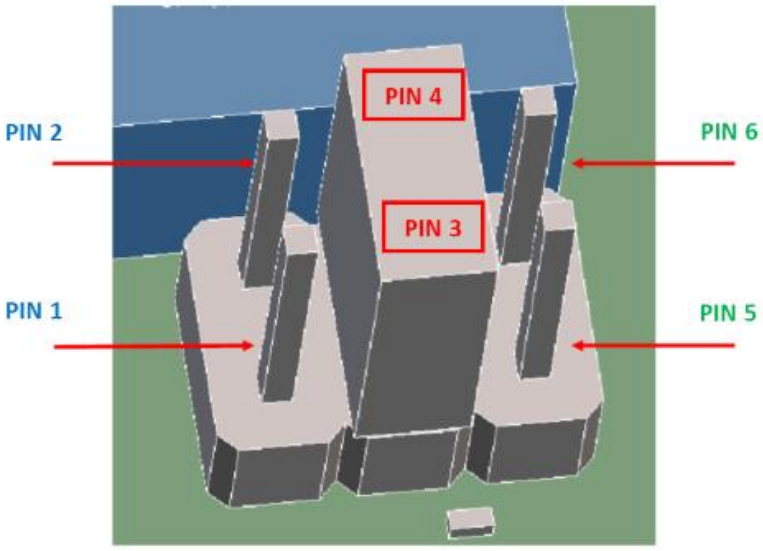
Only units with the same first four digits from RF MAC address (see picture above) can be used in one reading network.

Units with different initial four digits of RF MAC address are not established connection even when the setting of DIP switch is the same. For more information, see chapter 6.3 Configuration of multiple overlapping network.

6.2 CONFIGURATION OF PROTOCOL

By setting the jumpers on the radio boards of the A or B Combi units, protocol reception can be configured in Metra, Wireless or both.





Location of jumpers:

- **PIN 3 + PIN 4** = income of protocol Metra (jumper must be always placed!)
- **PIN 3 + PIN 4** and **PIN 5 + PIN 6** = income of protocol Wireless M-Bus
- **PIN 3 + PIN 4** and **PIN 1 + PIN 2** = income of protocol Metra and Wireless M-Bus (a repeated process of income of the Metra protocol and then Wireless M-Bus)

If the CRS 40 V3 reading unit switched on, we change the shoring jumper and then press the Reset button. After pressing the Reset button changes the settings. Protocol settings can be combined as desired within on reading network.

6.3 CONFIGURATION OF MULTIPLE OVERLAPPING NETWORK

Mainly in the housing estate, it can happen that installation of more reading networks in close buildings (or even in one building) is necessary. Only installation of multiple reading networks of one billing company with the same first four digits of RF MAC address (see chapter 6.1 RF MAC Reading network address) is described in this chapter. Installation of more reading networks of more billing companies does not require any further setting (see Figure 10: Overlapping networks of two billing companies).

To avoid connection of unit A to another reading network (i.e. to another unit B), it is necessary to distunguidh between such networks.

Distinguishing between reading networks od sone by DIP switch on radio module RFCC1101 (see Figure 2: Schematic of the radio module RFCC1101 and Figure 10: Overlapping networks of two billing companies. DIP switches are set to position OFF-OFF-OFF-OFF (0-0-0-0) by default.

It is possible to use default configuration of DIP switch when installing the first reading network. When installing next reading network, it is necessary to change DIP switch to another configuration on both control unit B and all collecting units A. 15 combinations can be used, configuration ON-ON-ON-ON (1-1-1-1) is reserve by the manufacturer.

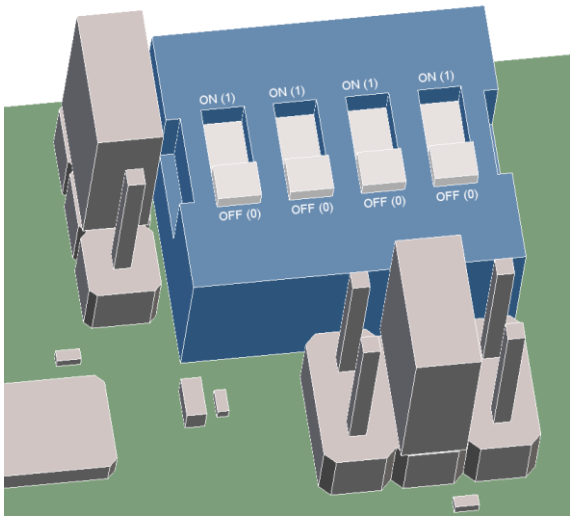


Figure 9: Scheme of DIP switch

Warning!

DIP switch configuration ON-ON-ON-ON is intended only for manufacturer test purpose. It must not be used in everyday operation. Such units are not functional.

The situation shown in Figure 10: Overlapping networks of two billing companies is only illustrative. In practice, the range of radio equipment, especially in the building, has no circular shape (see chapter 4. Spreading of radio waves)

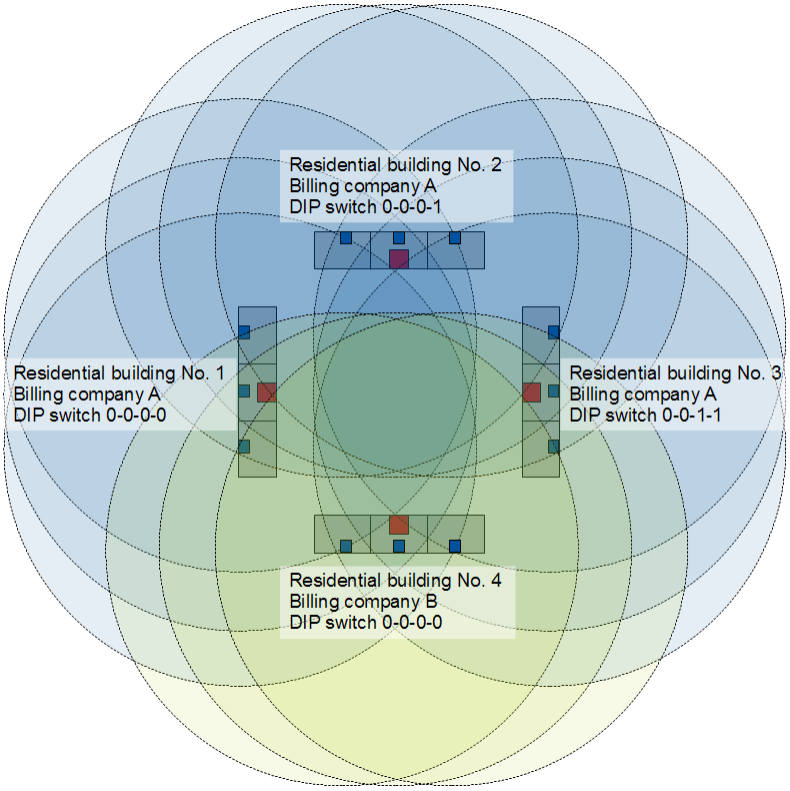


Figure 10: Overlapping networks of two billing companies

Warning!

If two reading networks with the same first four digits of RF MAC address and the same configuration of DIP switches would be started up, newly installed network will not work. It will be necessary to restart units B of both reading networks after changing the DIP switches configuration.

7 FIRMWARE UPDATES

Firmware is computer program specific for particular device and it is integral part of electronic appliance (Central reading system CRS 40). Firmware is programmed to internal memory of processor in radio module RFCC1101 and it is part of the hardware.

It can be appropriate to update firmware in some cases (e.g. add anew rad device or change of communication protocol used in reading network).

Warning!

Firmware update can be done by personnel trained by manufacturer using special programming device. Description of firmware update is provided to trained personnel as separate manual. Unit can be damaged by blackout during firmware actualization – we recommend to use laptop or computer equipped with UPS from this reason.

Modifications not authorized by manufacturer may be the reason for warranty void.

Note: Changes involving e.g. read data interpretation do not require firmware update. Such changes are implemented using update files that can be load to control unit B via Internet. For more information see Setting of system parameters.

7.1.1 Check/show of firmware version and firmware of radio module

Current version of firmware is shown on website in the footer.

7.2 UPDATE/UPGRADE UNIT B SOFTWARE

Update of internal software if unit B (e.g. changes in interpretation of read data, adding new features to the system) is done using update files supplied by the manufacturer. Check and installation of update files is performed after writing readings is finished.

Units B connected to internet download update file automatically from manufacturer's server, or it can be updated manually over web interface of the unit (see chapter 10.5 Setting parameters of system)

8 TROUBLESHOOTING

Description	Problem indication	Recommended solution
Collection unit A cannot commit a connection with control unit B	The red indicator LED on the radio module of the bus A unit remains lit even after the unit is restarted	Check that unit B is working
		Collection unit is too far from control unit B or there is and obstacle between them that is impenetrable to 868 MHz radio waves. **Move the acquisition unit A closer to the control unit B**
		Make sure that the DIP switch on unit A and B are set to the same configuration. If the settings are different, set the DIP switch to the same configuration. For more information, see section 6.3 Configuring multiple overlapping readout networks.
		Check that the DIP switch on unit A or B is not set to the ON position on all switches. This configuration is reserved for test mode and must not be used in operation. If DIP switch is set to the ON-ON-ON-ON position, change the switch settings. For more information, see section 6.3 Configuring multiple overlapping readout networks
		Try restarting first unit B and then unit A using the RESET button on the radio part board
The connection between collection unit A and control unit B breaks down	The red LED on unit A flashes irregularly	The link breaks down if the units are at the limit of their capabilities (too far or too close). See above for the solution. Place unit A at a smaller or larger distance form control unit B.
	The red indicator LED on unit A flashes regularly	The power supply to the unit is not sufficient. This may be due to weak batteries or a power supply failure, where the unit starts up but restarts when it tries to transmit due to insufficient power supply. **Replace the batteries or check the mains power supply.**
Collection unit A or control unit V is not working	Both indicator LEDs on the radio part are still off even after rebooting or disconnecting and connecting the power supply.	Power supply not working. If you use batteries for power, the voltage must be at least 2.2 V. **Replace the batteries or check the mains power supply.**
		There's been a malfunction in the unit. **Send it to the manufacturer for repair.**
Control unit B does not contain any data from one-unit readings	There is no data on the main page of the readout network	Verify that red LED on the A collection units is not lit (the units are therefore connected) and the green LED is flashing at irregular intervals of several minutes to indicate data collection. If unit A is not receiving any data, none will be displayed on unit B.

USER GUIDE PART

9 CONNECTING TO THE READOUT NETWORK

For remote work (such as from a computer in your office) with a central CRS 40 reading system, you need to connect to a so-called virtual private network that allows access to the reading network. A virtual private network (VPN) is a mean of interconnecting several devices through a public (untrusted) computer network, the Internet. The connected devices can communicate with each other as of they were connected within a single closed private (and therefore trusted) network. When establishing a connection, the identity of both parties is authenticated by digital certificates, authentication takes place, all communication are encrypted, and we can consider such as secured connection.

For the purpose of linking your computer to the reading network, a virtual private network is used. You will need to set up a connection to this VPN on the computer that you want to connect to the read-out network. Remote access is possible from both Microsoft Windows 7 and later operating systems, Linux, Mac OS from Apple or Android. The following describes how to install Microsoft Windows for PC and mobile services. The Linux and Mac OS operating systems are not included in this manual – contact Apator Metra employees for the installation procedure on these operating systems.

The actual connection to the reading network is already running through any web browser (e.g. Mozilla Firefox, Microsoft Edge, Google Chrome, etc.)

9.1 VPN NETWORK STRUCTURE

As already mentioned, this is a virtual private network. This network looks like an isolated network from the outside without access to others without knowing the login name and password.

The central readings system CRS 40 is set in such way that the IP address (device identifier within the computer network) is defined as 10.Z1.Z2.X. The first group of digits (10) is invariant, the other two groups of digits (Z1.Z2) are designated by the manufacturer, and their specific combinations (e.g. 124.201) are for one customer only. Range X is divided according to the following key:

0,1 reserved

2-20 computers

21-254 reading networks (represented by control units B)

255 reserved

The IP address of the control unit B (and therefore the whole reading network) can be found on the identification label (see Figure 8: Identification label of the unit B). The address is specified by the manufacturer, it is unique for each B unit manufactured and can't be changed.

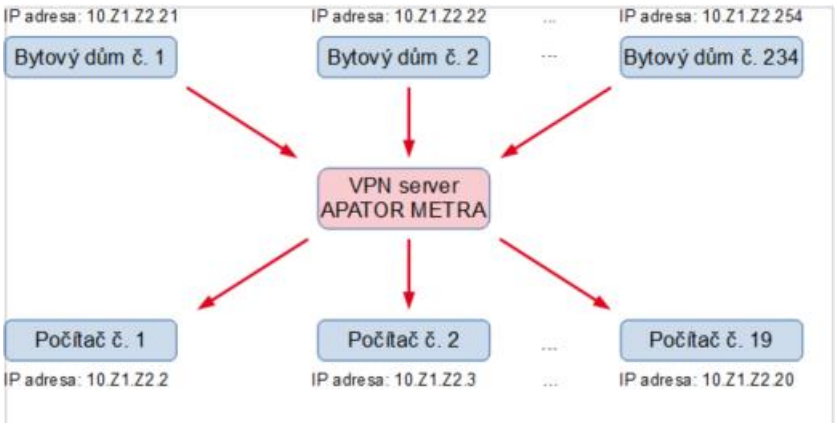


Figure 11: VPN network illustration

The number of devices that can be simultaneously connected to a single network is limited to 253 for technical reasons. This means a maximum of 234 B units (representing read-only networks) and up to 19 computers that connect to read-out networks.

9.2 VPN CONNECTIVITY OPTIONS

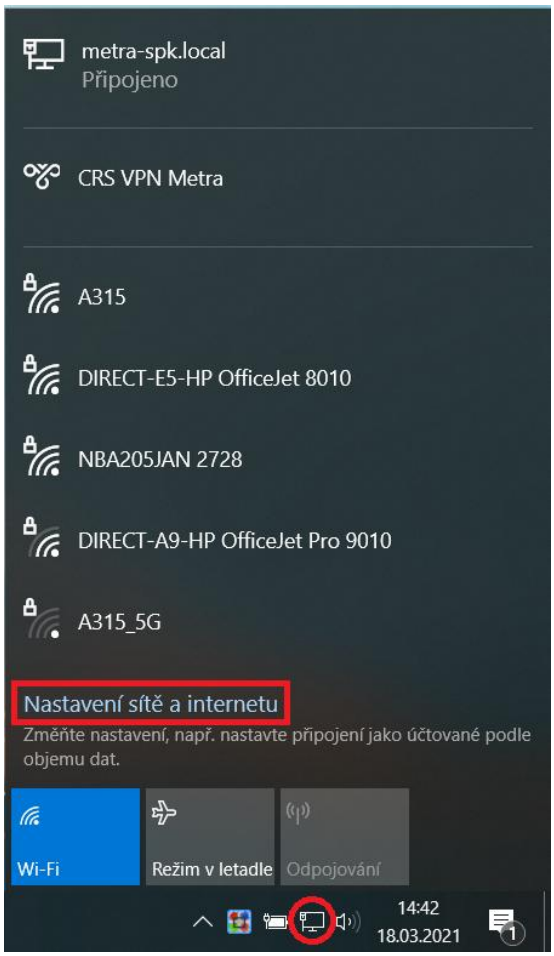
9.2.1 Connection via PC

9.2.1.1 Integrated Microsoft Windows client

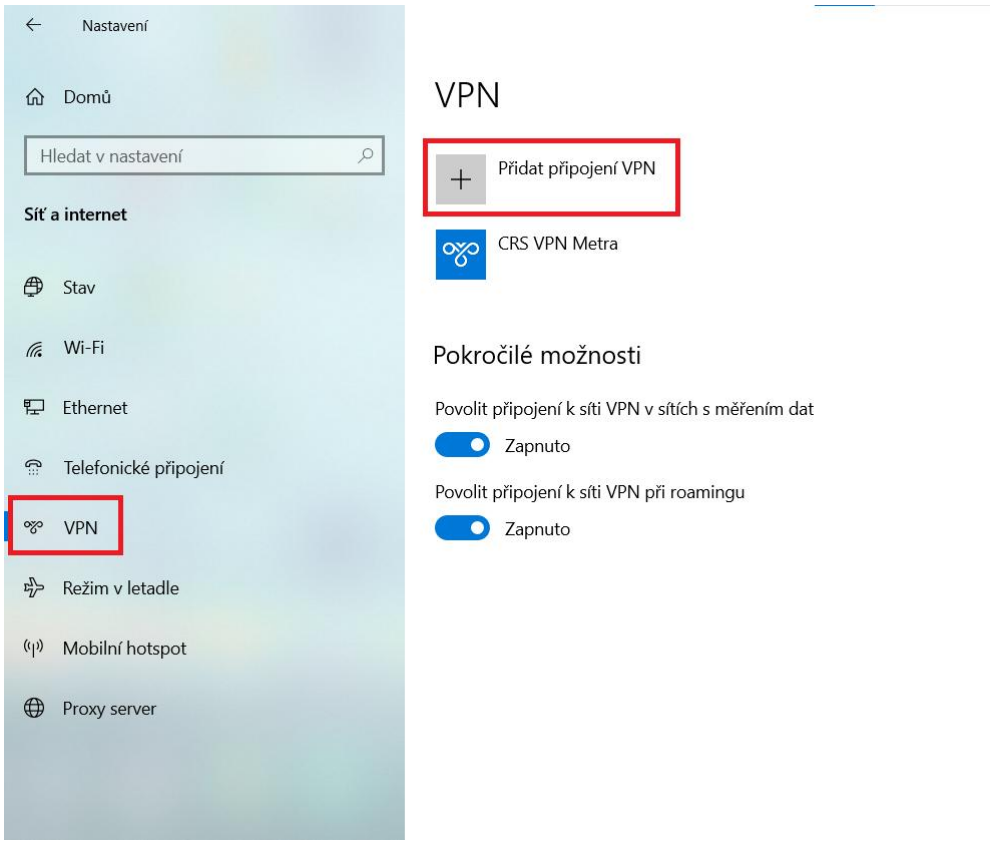
This method makes use of the integrated VPN client. The procedure as been tested on both Windows 7 and Windows 10.

Setting method:

1. Open the Network connection and Internet



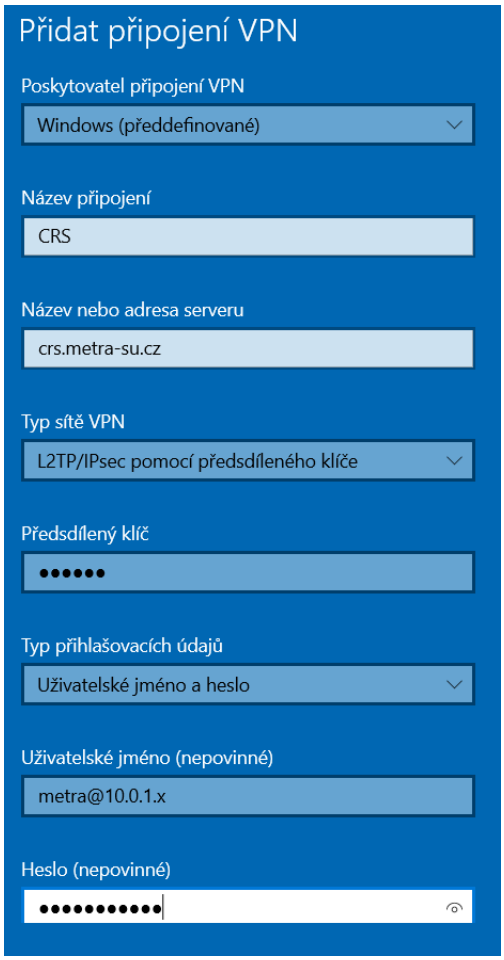
2. Add VPN connection



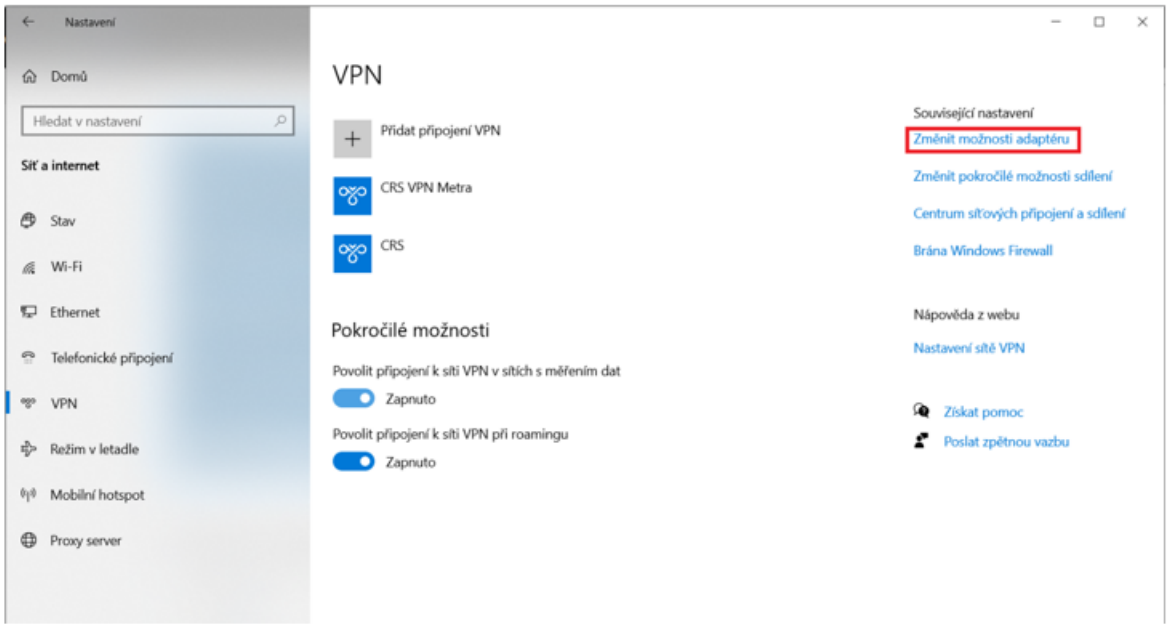
3. **Fill in the following:**

- VPN provider: Windows (predefined)
- Connection name: choose a name e.g. CRS
- Server name or address: crs.metra-su.cz
- VPN network type: L2TP/IPsec using pre shared key
- Pre-shared key: CrsVpn
- Type of credentials: Username and password
- Username (optional)
- Password (optional)

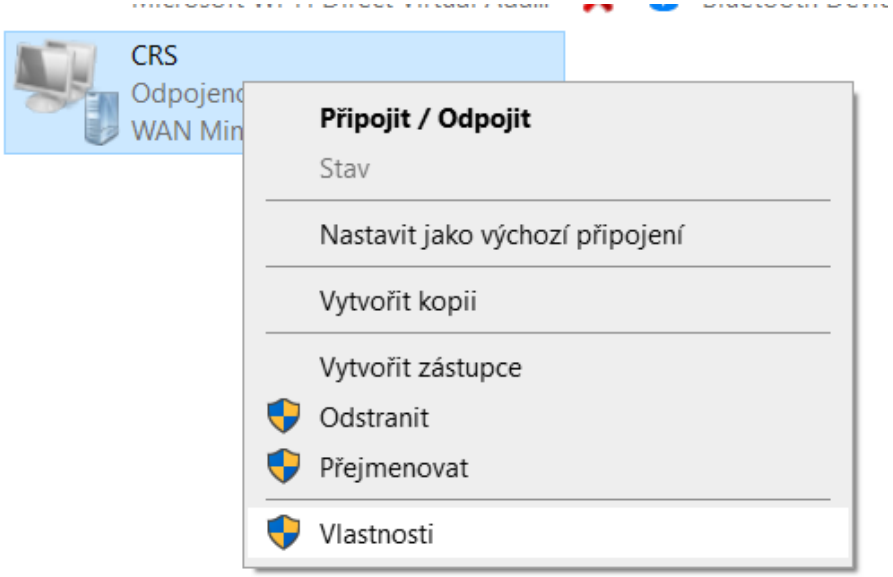
If you want to connect to multiple hubs, leave the username and password blank and enter the hub specific name and password each time you connect. (For connecting to multiple hubs, the SoftEther program is more suitable).



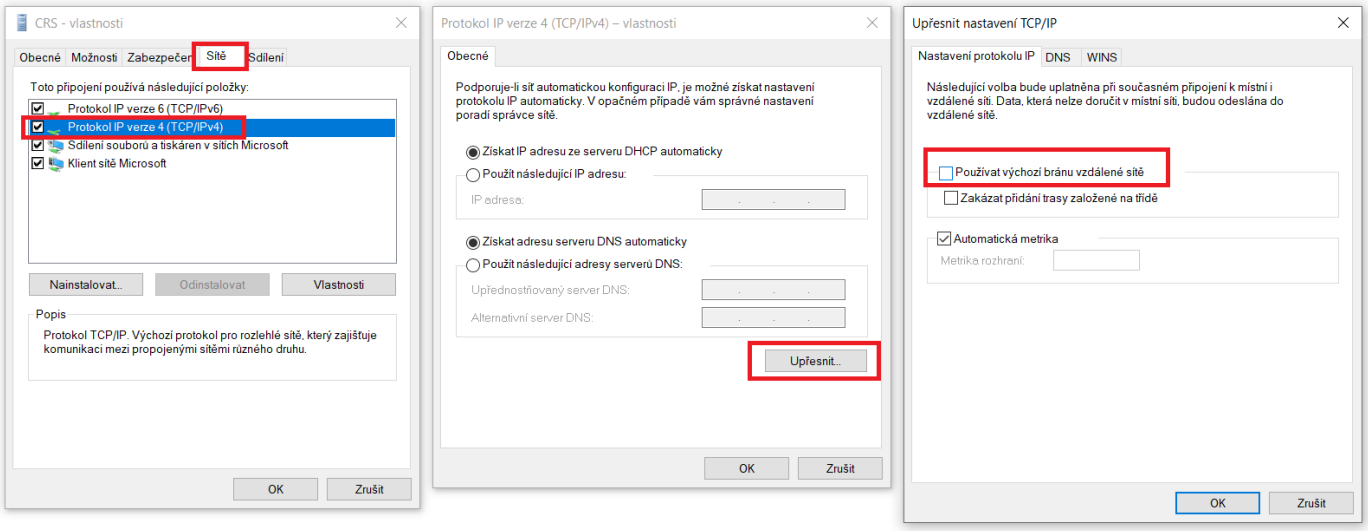
4. Click on change adapter options.



5. Click on the name of the VPN connection you created and choose Properties.



6. Choose Networks -> IP Version 4 (TCP/IPv4) -> Advanced -> Untick “Use remote network default gateway”.

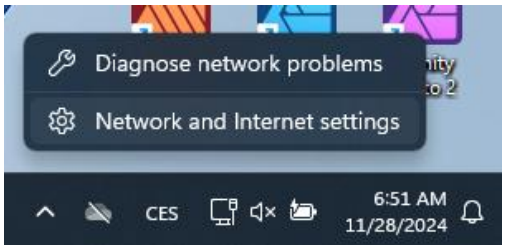


7. Enter the CRS IP address of the hub you connected to into your browser
8. The CRS welcome page will appear. Click Sign In.

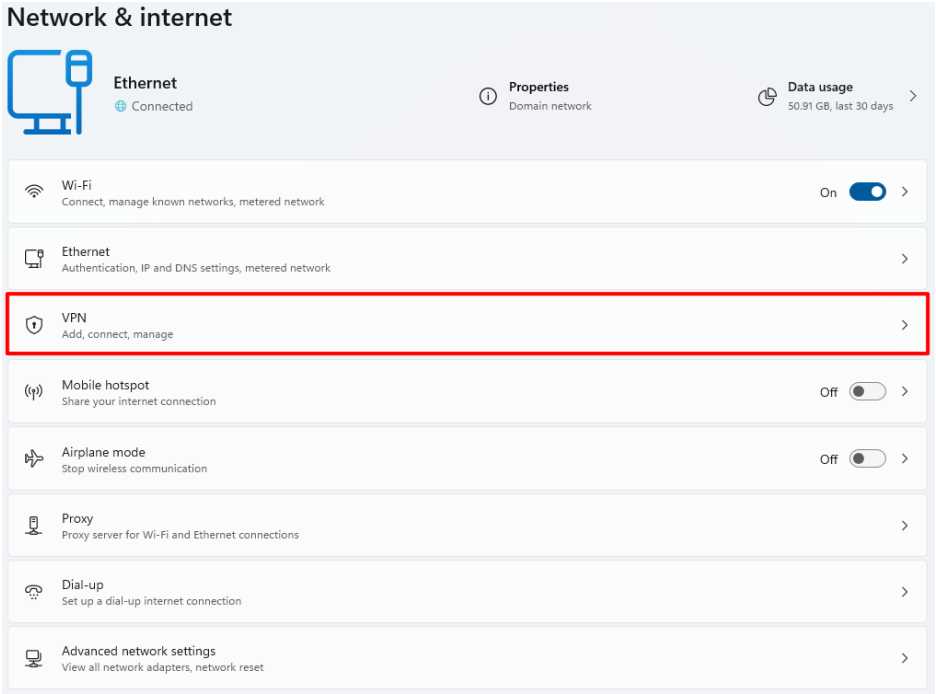
9.2.1.2 Windows 11 VPN client

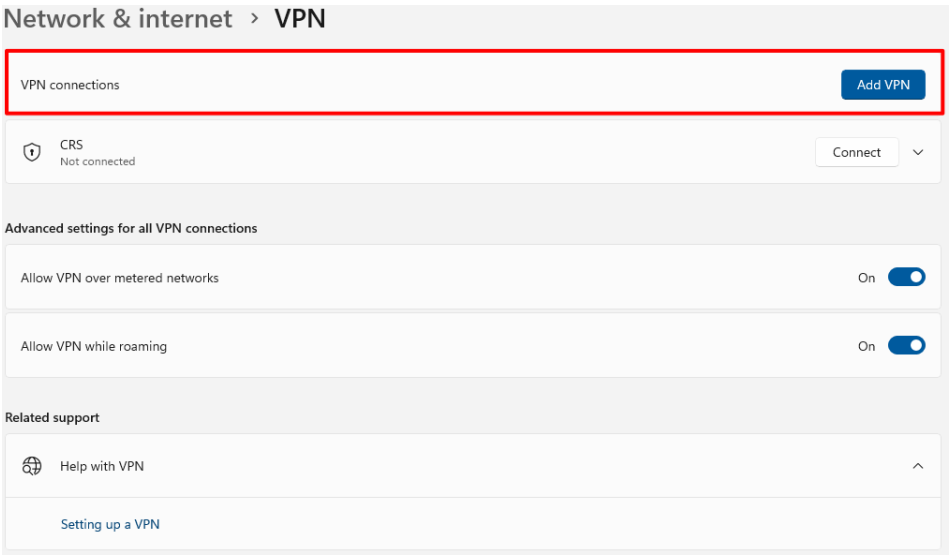
Set up procedure:

1. Open the network and internet settings by right-clicking on the connection icon in the bottom bar.



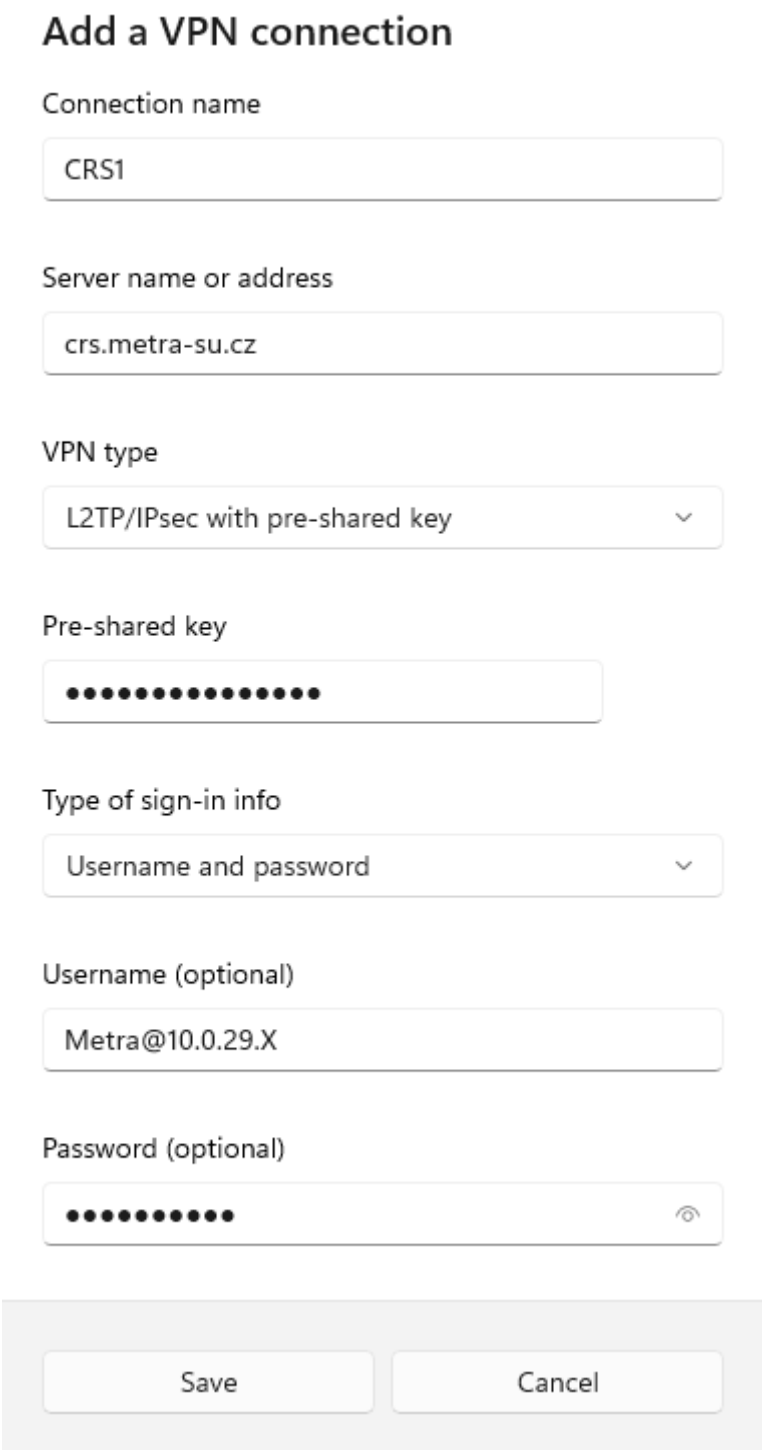
2. Select VPN from the menu and then add a VPN



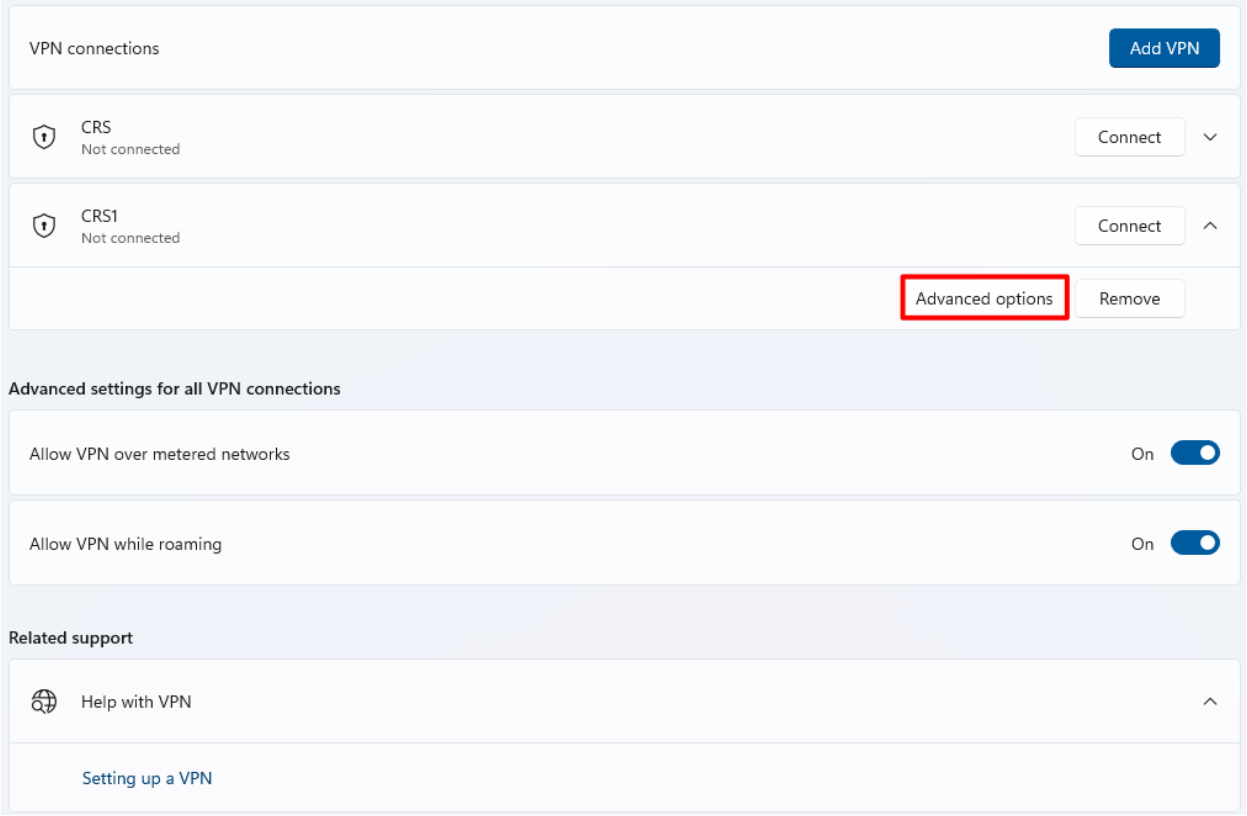


3. In the window that pops up, fill in the following:
   - VPN Connection Provider: Windows (predefined)
   - Server name: (choose a name, e.g. CRS)
   - Type of VPN: L2TP/IPsec using pre-shared key
   - Pre-shared key: CrsVpn
   - Login type: username and password
   - Username (optional):
   - Password (optional):

If you want to connect to multiple hubs, lave the username and password blank and enter the name with specific hub and password each time you connect. (SoftEther is preferable for connecting to multiple hubs).

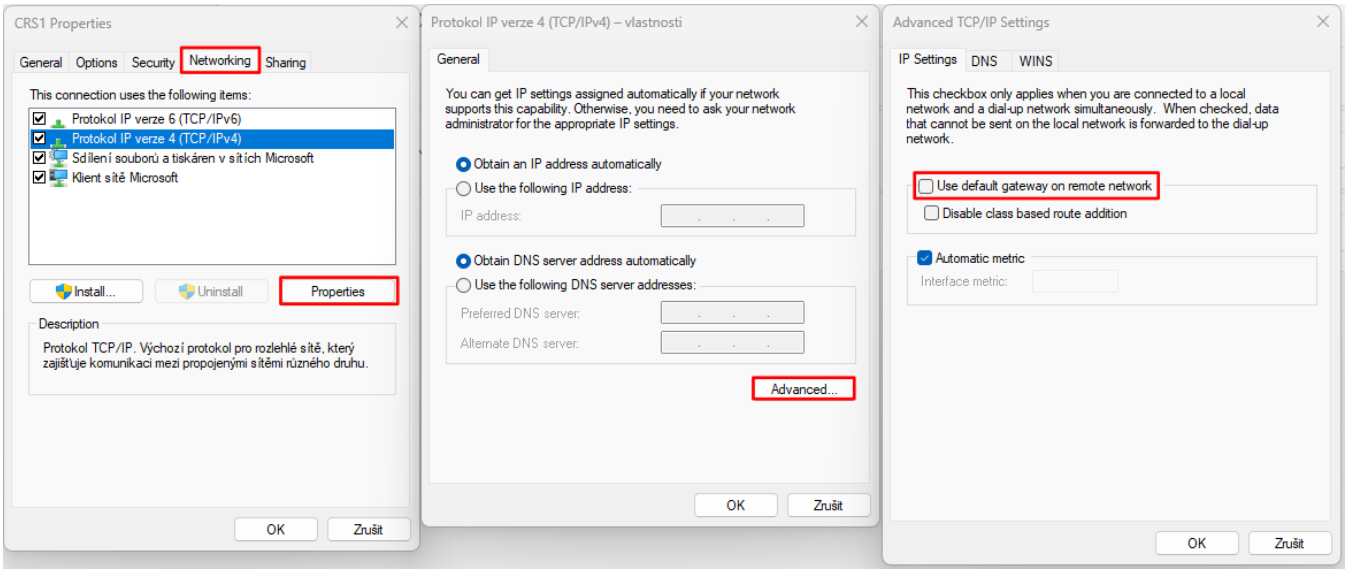


4. Click on the added VPN (CRS1 in the picture) and select “Advanced Options”.



5. Under “More VPN options”, click “Edit” button.

6. Select the “Networking” tab → “IP Version 4 (TCP/IPv4) → “Properties” → “Advanced” and uncheck “Use default gateway on remote network”. Confirm the settings with OK button.



7. Enter the CRS IP address form the hub you connected to into your browser
8. The CRS welcome page will appear. Click on “Login”

SoftEther Client Manager

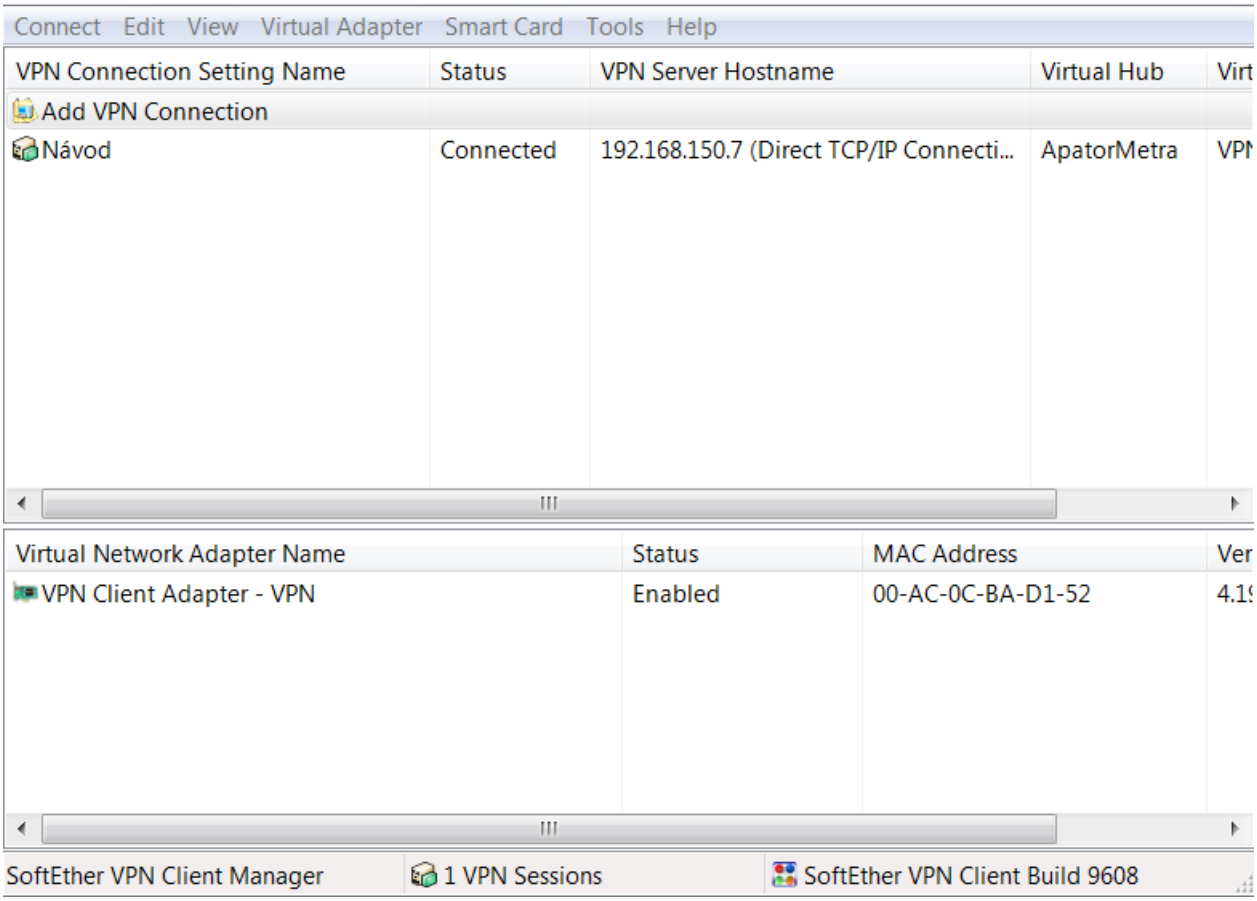
To install a VPN client, download the appropriate installation file from the address:

http://www.softether-download.com/en.aspx?product=softether.

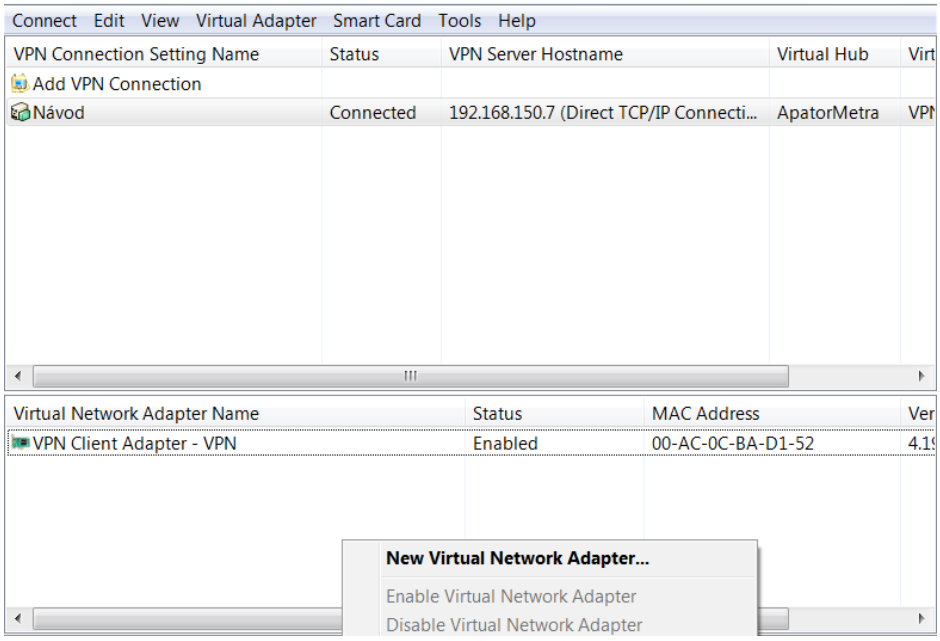
After download, you can install it – press the Next button, then check the license agreement on the third page.

Basic settings of the VPN client

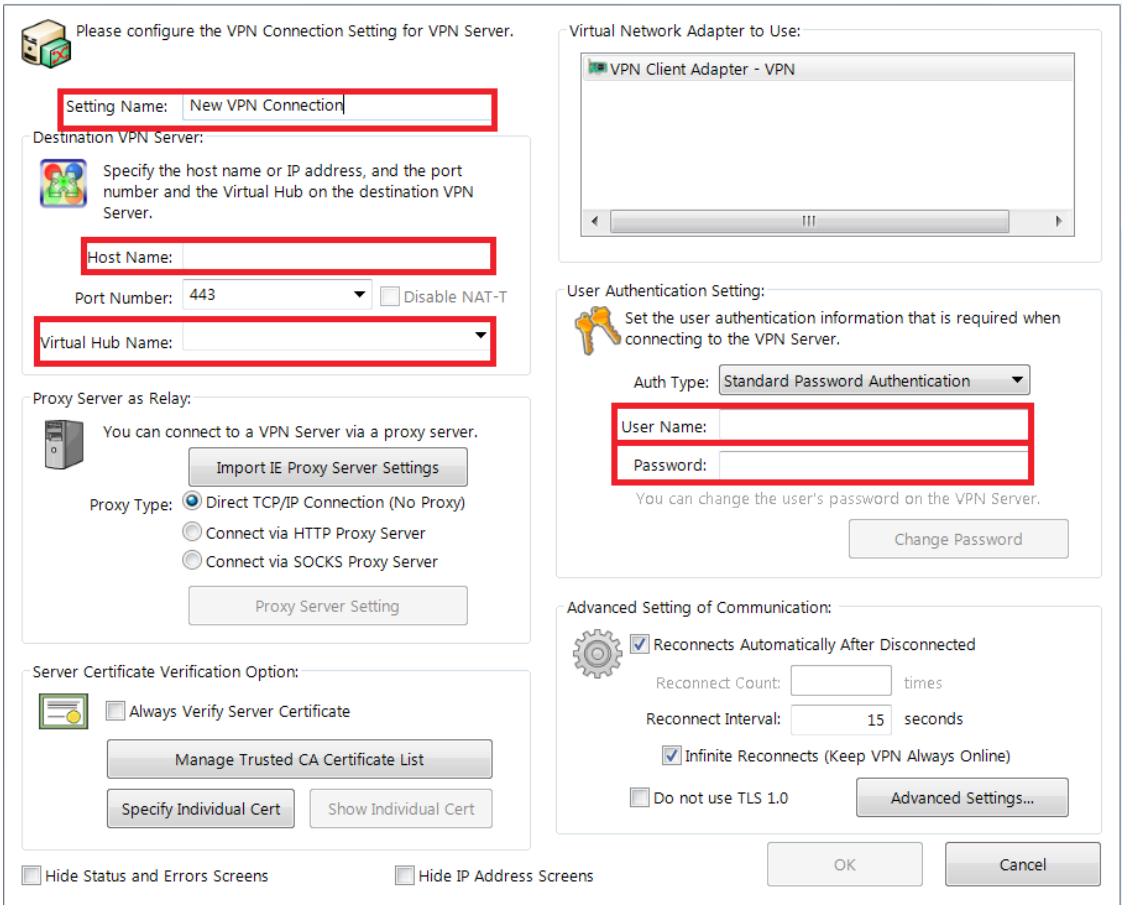
1. Start the program SoftEther Client Manager



2. Right click at the bottom of the window an select New Virtual Network Adapter and enter the name of the virtual network card, such as VPN.



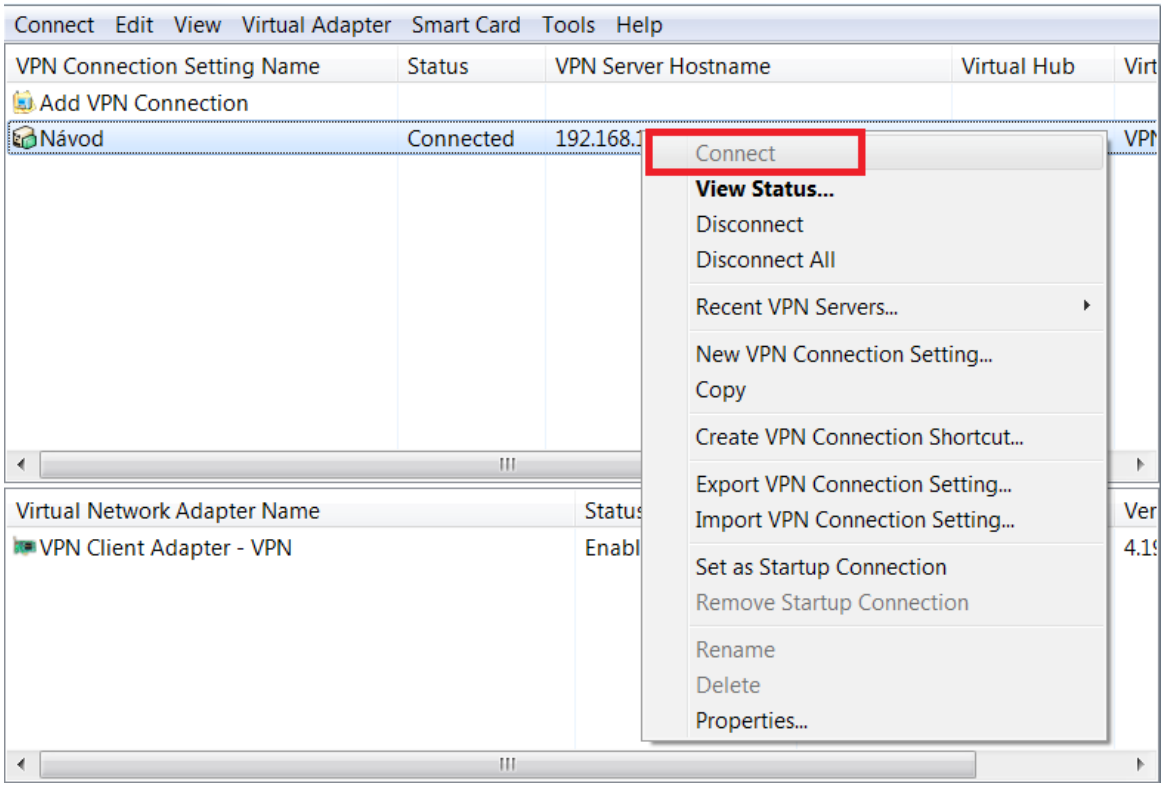
3. Click Add VPN Connection at the top.



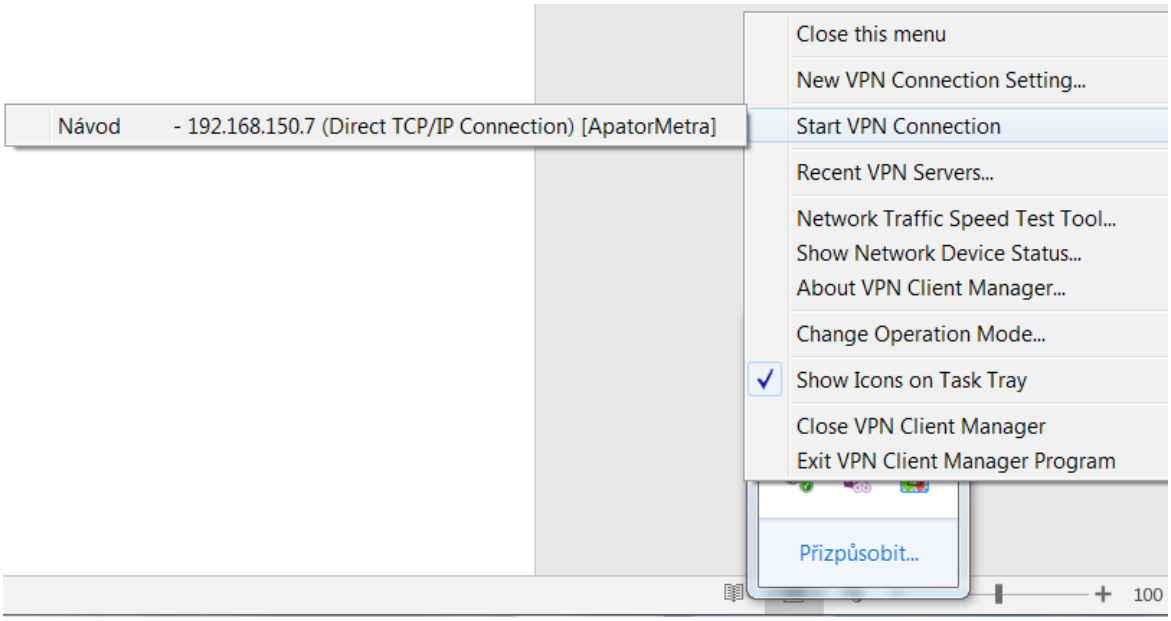
Fill in: Setting name (some connection name), Host name (crs.metra-su.cz), Virtual Hub Name (enter the name of the Hub, which will be given to you by employees of Apator Metra s.r.o.), User Name and Password (you will get these from employees of Apator Metra s.r.o.) and confirm with OK button.

You can join in several ways:

1. Right-click the row in the manager and choose connect



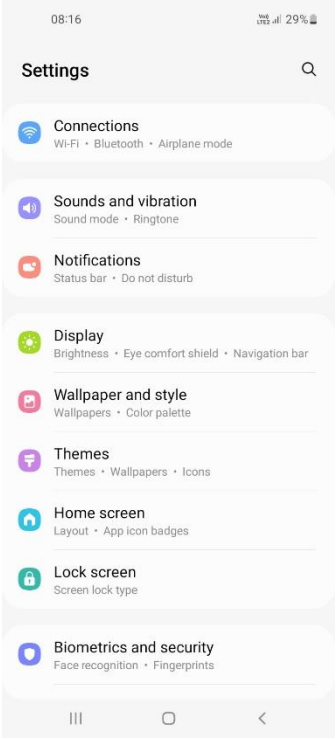
2. In the lower-right bar, click the arrow to display the hidden icons, then right-click the manager icon and select Start VPN Connection – select the connection you want. Such a connection to the Client Manager is always required when the computer is turned off and on, and it is recommended to connect only when needed.



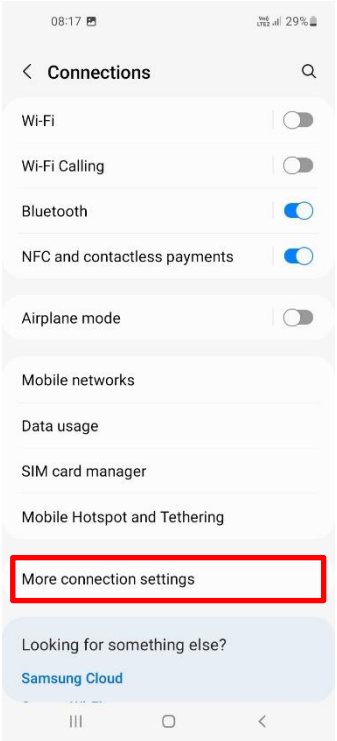
9.2.2 Connecting via mobile device

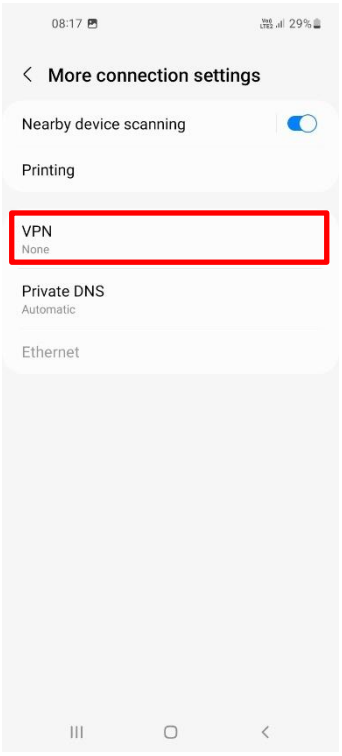
9.2.2.1 Android operating system

1. Open Settings on your mobile device

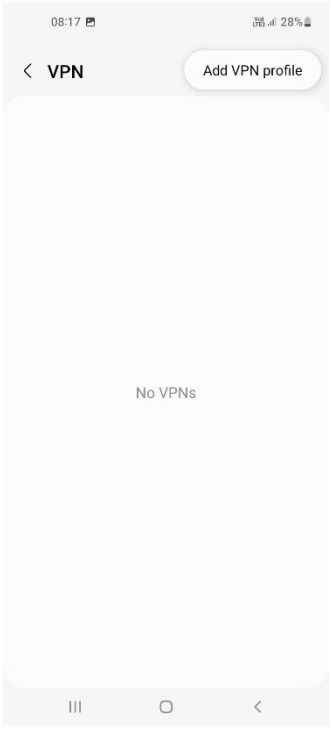


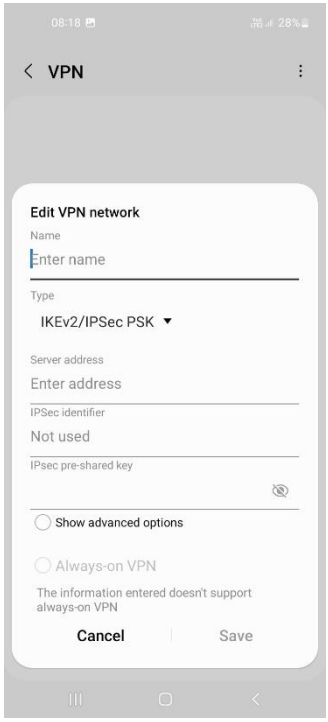
2. Click on Connections then More connection settings and VPN



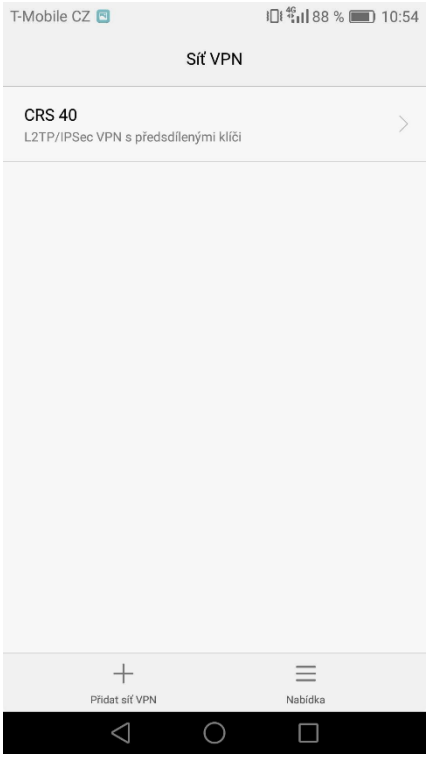


3. Click on the VPN Network and then the “Add VPN profile”. Fill in the “Network Name” field, for example CRS 40, select L2TP/IPsec PSK in the network type. Fill in the server address and the pre-shared IPSec key, which will be provided to you by employees of Apator Metra s.r.o.

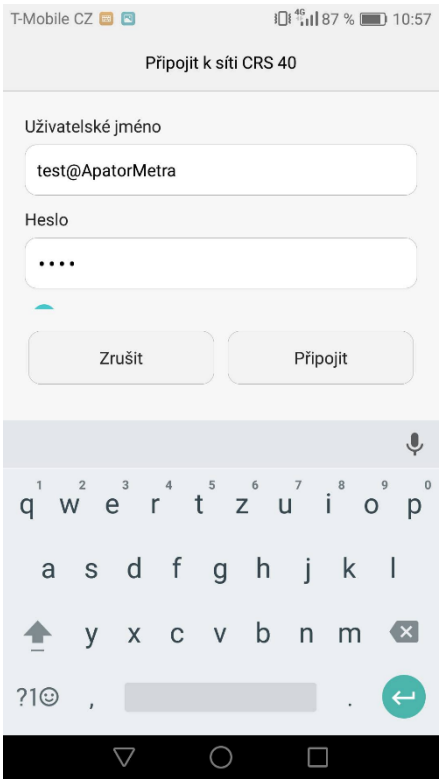




4. The VPN called CRS 40 was created



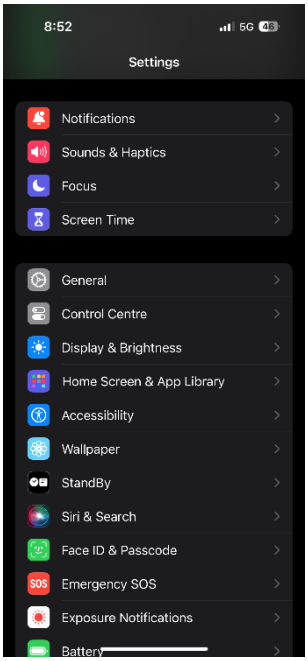
5. To make a connection to the CRS 40 network, you need to enter the user name and password, this information will be provided to you by employees of Apator Metra s.r.o.

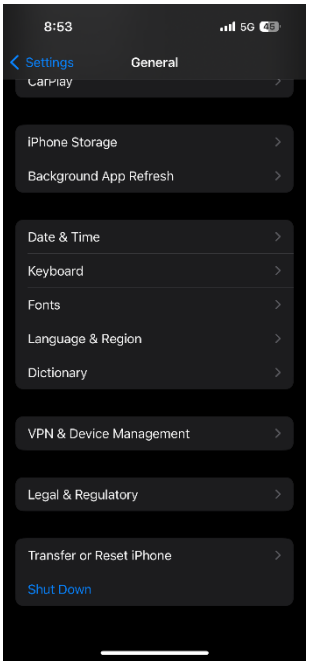


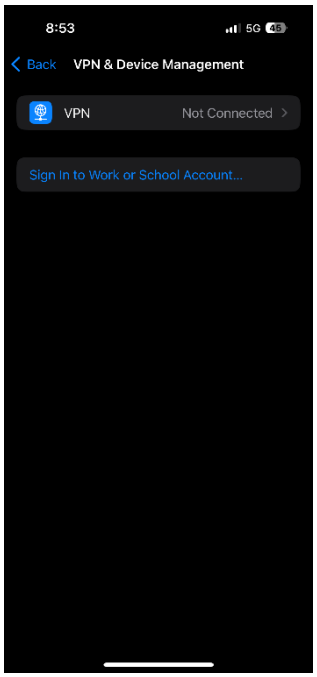
6. In the web browser visit CRS address, login and then you get access to data reading overview.

9.2.2.2 System iOS

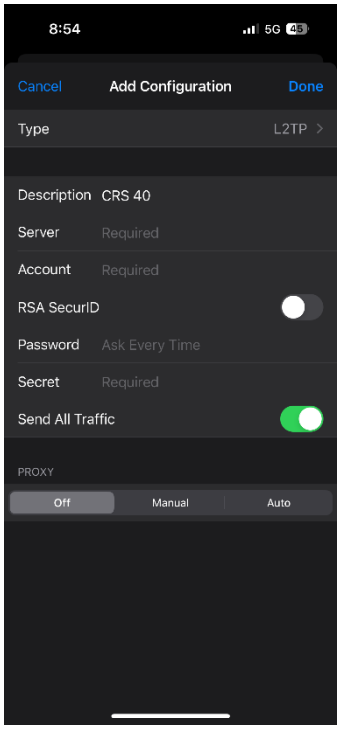
1. In your mobile device open “Settings” -> “General” -> “VPN and Device Management” and click on







2. On configuration screen fill in these data: “Type” set as “L2TP”, “Description” can be any name (in image is “CRS 40”). Further fill in “Server”, “Account” and “Shared key”, these data will be shared by an Apator Metra employee. Switch “Send all” turn off, Proxy settings leave as it is – turned off. After you tap on “Done” new VPN connection is created.



10 DESCRIPTION OF THE GRAPHICAL INTERFACE

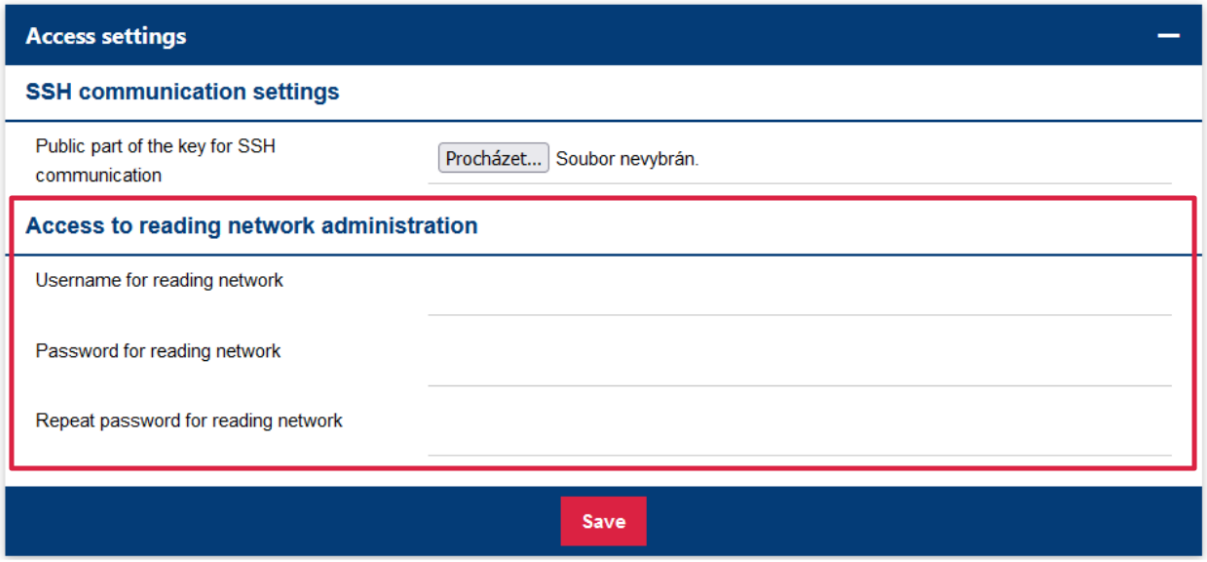
10.1 CONNECTION TO THE READING NETWORK

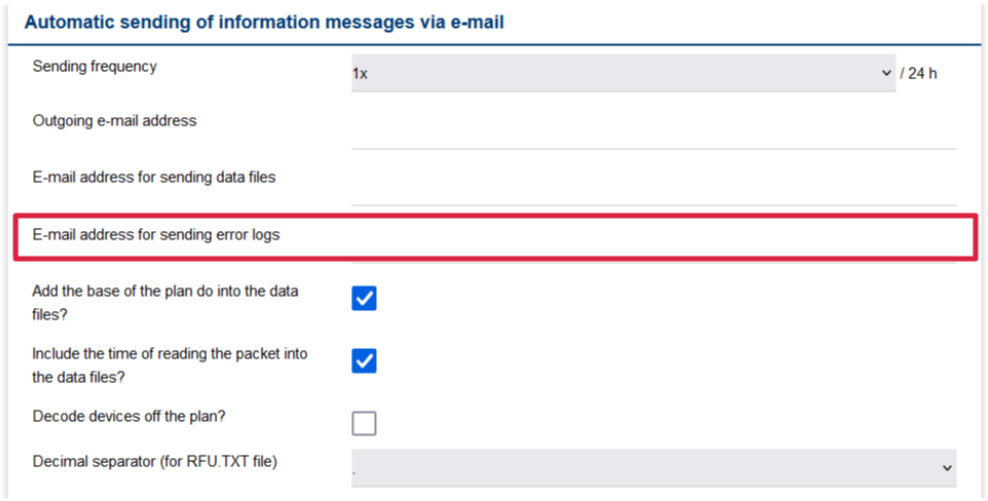
Open a web browser, e.g. Google Chrome, Mozilla Firefox, Microsoft Edge, etc. The list of browsers for which the software is tested is given in chapter 3.2 Technical data. In case of using a different browser or an older version, some functions may not be available. In the address bar, enter the IP address of the control unit B of the readout network you want to connect to. The IP address can be found on the unit's identification label (Figure 8: Identification label of the units B). Be sure to check that you are connected to a VPN (see Chapter 9 Connecting to the readout network).

10.2 LOGIN TO THE READING NETWORK

After connecting to the readout network, the login page opens first. The default login name and password for the first login is "admin" (without quotation marks). After the first login, change these details in the Settings (Access Settings).

In case you forget your login details, you can have them sent to the e-mail address you entered in Settings (Basic settings)





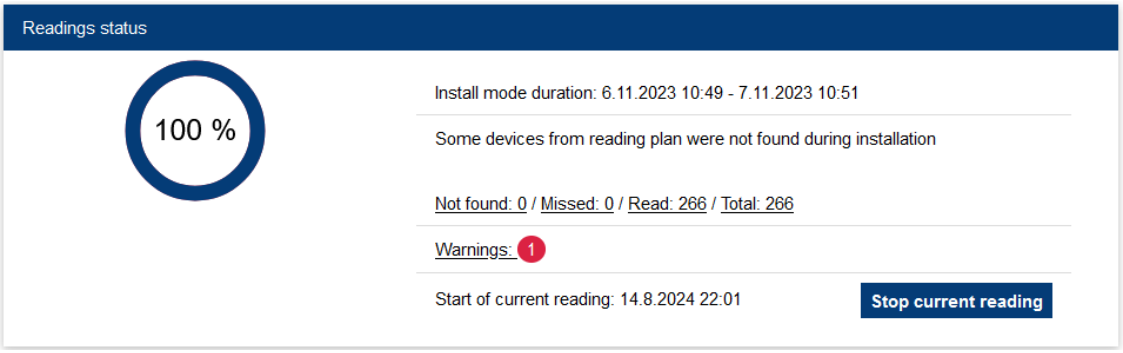
10.3 READING NETWORK HOME PAGE

After a successful login, the Reading network Home page opens. In the header of the page there are options to select the page language and a Menu with a navigation window where you can find Home page, Reading network status and Settings.

10.3.1 Home page

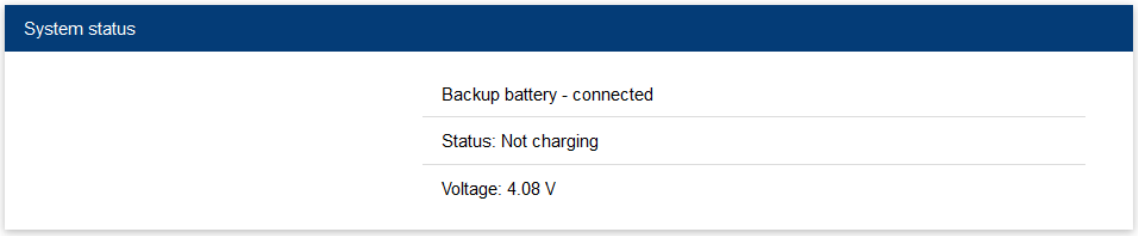
10.3.1.1 Reading status

In this panel you can find information about the status of readings and reading devices. The percentages in the circle indicate the completeness of the readings according to the reading plan. A readout unit is condidered as not found if no data is received from this unit for more than a set period of time (7 days by default, see chapter 10.5 Setting system parameters for more information). This may be due to malfunction, disassembly, or covering with radio impermeable material. A unit is classified as not read if it has not been read by the system for at least 1 day, but less than the set time. The reason for classifying the unit as unread may be only a temporary deterioration of the radio transmission conditions, therefore it is not considered as an error by the system (no error message is sent). The “Warning” otem displays a warning for the current reading.



10.3.1.2 System status

The panel shows the status of the system. Xou can find an overview of the battery status and voltage.



10.3.1.3 Overview table

In the overview table you will find the data of each reading, the Found/Not Read/Total overview, which shows the number of units on a given state on the reading (see chapter 10.3.1.1 Reading status), the number of warnings, the excessive backflow for water meters that have exceeded the defined limit and two columns with downloadable file Diagnostics and error messages and Data files.

Date	Not found / Missed / Total	Warnings	Excesive backflow	Diagnostic and error logs [.ZIP]	Data files [.ZIP]
2024-08-14_0	0 / 0 / 266	1	0		
2024-08-13_0	0 / 0 / 266	1	0		
2024-08-12_0	0 / 0 / 266	1	0		
2024-08-11_0	0 / 0 / 266	1	0		
2024-08-10_0	0 / 0 / 266	1	0		
2024-08-09_0	0 / 0 / 266	1	0		
2024-08-08_0	0 / 0 / 266	1	0		
2024-08-07_0	0 / 0 / 266	1	0		
2024-08-06_0	0 / 0 / 266	1	0		
2024-08-05_0	0 / 0 / 266	1	0		
2024-08-04_0	0 / 0 / 266	1	0		
2024-08-03_0	0 / 0 / 266	1	0		
2024-08-02_0	0 / 0 / 266	1	0		
2024-08-01_0	0 / 0 / 266	1	0		

10.4 READING NETWORK STATUS

The reading network status can be found in the navigation menu in the page header. Here you will find information about the unit B and an overview of the connected units A and measuring devices.

B unit

Address	Role	DIP switch	Frequency	Protocol	Firmware version
001d01ad	B	0 0 1 1	EU		3.2.0.835

A units

Address	Average RSSI	Connections	Last contact	Unique serial numbers	DIP switch	Frequency	Protocol	Firmware version
001d007d	-63.35	17	15.8.2024 10:25	507	0 0 1 1	EU	Metra	3.2.0.835
001d007e	-27.00	16	15.8.2024 10:24	433	0 0 1 1	EU	Metra	3.2.0.835
001d007f	-25.18	17	15.8.2024 10:24	555	0 0 1 1	EU	Metra	3.2.0.835
001d0094	-65.59	17	15.8.2024 10:25	526	0 0 1 1	EU	Metra	3.2.0.835

Sensors

Serial number	001d007d			001d007e			001d007f			001d0094		
	Last contact	Connections	Average RSSI	Last contact	Connections	Average RSSI	Last contact	Connections	Average RSSI	Last contact	Connections	Average RSSI
0101-00077937				15.8.2024 09:29	1	-98.00						
0101-00140520	15.8.2024 10:14	1	-79.00									
30491526	15.8.2024 09:39	1	-57.00							15.8.2024 09:35	1	-77.00
30491527	15.8.2024 10:25	3	-62.67							15.8.2024 09:53	1	-74.00
30491528	15.8.2024 09:50	1	-74.00							15.8.2024 10:18	2	-76.00
30491529	15.8.2024 10:22	2	-86.50							15.8.2024 10:18	2	-83.00
30491530	15.8.2024 10:11	2	-58.00							15.8.2024 10:07	2	-71.00

10.5 SETTING NETWORK PARAMETERS

You can configure the parameters of the readout network in the Settings tab in the navigation menu.

10.5.1 Basic settings

Here you can set the parameters for system operation (language, time zone, reading network name, sending info messages, diagnostic and error messages, and enabling the SFTP server).

Default language – The language in which the system pages will be displayed, error messages will be generated and e-mails will be sent.

Reding network name – Text naming of the network, under this name the network will be identified in error messages and information e-mails. The setting does not affect functionality.

Automatic sending of information messages via e-mail – In this section, you can set the frequency, how often the system will send data, from which address, and what will be included in the files sent.

E-mail address for sending data files – information messages will be sent to you from this e-mail address (it will be indicated as the sender in the information e-mails). You can set up rules for forwarding emails on your email server or filter inboxes in your mail client. If you are using a standard SMTP server, this should be an email address from a real domain (depending on your email server settings – emails from non-existent internet domains are usually ignored). If you use a different SMTP server, check with your ISP for the readout network for the readout unit. In case of non-completion, you will not be able to have forgotten login details sent to your email.

E-mails address for sending error logs – you will receive an informational email with error messages to this address. You will only receive an email of the system detects an error. The following conditions are considered to be an error:

- The unit has not been read by the system for a set period of time (7 days by default)
- The electronic seal on the unit has been broken
- The return flow on the radio module of the water meter is higher than the set value (See Diagnostics and error messages)

Error messages are sent in standard HTML format for web browsers and are packed in a ZIP archive. We recommend paying close attention to these messages. It is advisable to have them sent to a different e-mail address than the daily readings. You can also view the error message at any time on the readings evaluation page or download them packed in a ZIP archive. In case you forget your login or password to the system, you can have it sent by e-mail to this address. We therefore strongly recommend that you fill in the e-mail address for sending error messages.

Diagnostic and error logs – Here you will find the setting of the set value of the excessive backflow and the setting of the not found unit.

Excessive backflow – enter the maximum backflow limit in percentage in this field. If the backflow rate of the water meter exceeds the set value, the system will evaluate the situation as an error. This is indicated on the reading network home page. If an address is set up for sending error messages, you will also receive and e-mail notification.

Missing read device – if the unit being read (heat cost allocators or radio module for water meters) is not read by the system for the set number of days, it will be considered as not found. It will be listed on the Reading network Home page and will be further classified from the error message. This setting will also be reflected during installation – after the set time, the system will exit the installation and go into normal operation. If this field is left blank, the system will use the default setting of 7 days.

SFTP settings

Using an SFTP server will allow access to data or unit settings through the SFTP server, even if the unit is not currently connected to the VPN. If you with to use this feature, select the option “Send data to SFTP server (by checking the box). When you select this option, the SFTP server settings will expand. The Server address, Port and User fields are used to configure the connection to the selected SFTP server. For security reasons, the use of encryption keys is required to connect to the server. The so-called private key for the connection to the SFTP server can be uploaded using the “Browse” (“Procházet”) button next to the item Private SSH key. Your IT department or connection provider will provide you with the data for connecting to the SFTP server.

10.5.2 Connection settings

In this part of the settings you can configure the Ethernet network connection, Wi-Fi adapter settings. GSM modem and data consumption control.

Network connection (ethernet)

IP address – Use the fixed IP address setting only of you cannot use dynamic IP address allocation using DHCP (for example, if your ISP does not use it). This is an IP address within your provider's network and is in no way related to the IP address shown on the label of the controller unit B. Your connection provider will provide you with all the information you need to set up the unit's connection to the Internet. If you want to use the DHCP protocol (the default option in most cases), leave this field blank.

Network mask – Fill in only if you are using a fixed IP address (see above). Your connection provider will tell you the correct settings.

Gateway – Fill in only if you are using a fixed IP address (see above). Your connection provider will tell you the correct settings.

DNS server – Setting up a primary and secondary DNS server. Fill in only if you are using a fixed IP address (see above). Your connection provider will tell you to correct settings. The address of the alternate DNS server does not need to be filled in (but it will allow the system to connect to the Internet even if the preferred DNS server fails).

GSM modem settings

To set up the GSM modem, you must first enable the GSM modem. A menu will open for you to full in the APN and the PIN to connect to the internet.

Data usage check settings

Here you can enable data checking. With data checking enabled, you can set a monthly data limit and alerts when the specified percentage is exceeded, as well as set VPN restrictions when the set percentage of data consumed is exceeded. This shows a summary of how much data is currently consumed out of the limit.

10.5.3 Reading plan, authorisation keys and base of plan

In this part of the settings, you can upload your files to the reading system.

Reading plan

The reading plan must be uploaded for the meter reading to work. The current readout plan can be viewed undr the plan upload box. Reading plan formats are .CSV or .PL.

Authorisation keys

Authorization keys must be uploaded. The measuring device cannot be read without the authorisation keys. Authorization key formats are .AUTH or .CSV.

Base of plan

The plan base serves as a support file to the subtraction plan. When using the .CSV format for the reading plan, this field is optional. When using the .PL format, the plan base must be uploaded.

10.5.4 Update/upgrade software

If a new version is released, the system software can be updated. The current version can be found on the website www.metra-su.cz in the section for authorized partners. In case of doubt, please contact the manufacturer. The update file must be in .UPD format. Updating the file requires a system restart.

10.5.5 Access settings

SSH communication settings

It was mentioned earlier that there are two SSH key text files (the private and public portions of the key) that are needed for encryption between CRS and the computer (when backing up data). **Do not upload or give the private part of the key to anyone, it is for your use only**. The public part of the key is uploaded in a text file to the above access data settings. Click on "Select file" ("Procházet") and upload the text file.

Access to reading network administration

Here you can change your login and password to the meter network (i.e. to one unit B and several units A of the CRS 40)

Username for reading network – The login name for administrative access to this readout network (i.e. to one unit B and several units A of the CRS 40). In case you forget your login name, you can have it and your password sent to the e-mail address you entered in the e-mail address field for sending error messages.

Password for reading network – Password to access the administration to this readout network (i.e. to one unit B and several units A of the CRS 40). In case you forget the password, you can retrieve it together with the login name to the e-mail you entered in the email address field for sending error messages.

10.5.6Servis functions

The service function offers 4 options. Start Installation Mode, Factory Reset, Restart Device and Shutdown. Re-starting the device means complete reboot of the device, basically turning the device off and on again. Shutdown in a complete shutdown of the CRS device, and the device can only be turned on by restoring power to Unit B.

11 FOR THE ADVANCED

From time to time, it is advisable to back up the data from the reading network controllers to your computer disk (and possibly back it up to USB hard drive or USB disk). To avoid having to download data for each day from each B control unit separately, it is possible to perform an automatic synchronisation. This is particularly advantageous if you manage a large number of readout networks.

First, download the necessary files from the manufacturer's website www.metra-su.cz/en

Synchronization can be used in two ways, either by encrypting with a key or by using a name and password

Generating a security key

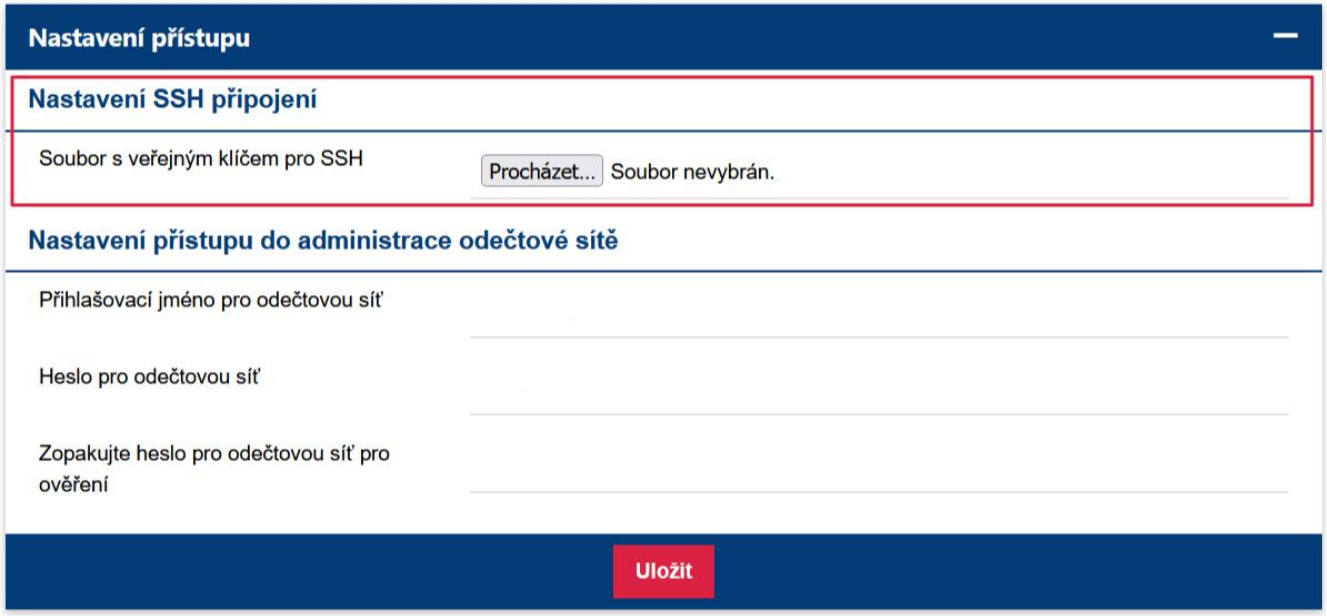
Before starting synchronization for the first time, you need to go through all the steps listed here.

1. **Generate key files to encrypt communication with CRS**

   When you run the "metra_keygen.bat" file, two files are created: key_sync and key_sync.pub. the private part of the key is stored in the first, and the public part of the key is stored in the second. Do not send, share or show the private part of the key to anyone. This is similar to a password.

2. **Copying the public part to CRS**

Log in to CRS using your username and password. On the settings page, in the "Access settings" section, select the key_sync.pub file by clicking the "Select File" button next to "Public part of the key for SSH communication" and confirm with the "Save" button.



11.1 BASIC SYNCHRONIZATION SETTINGS

Here we describe the basic synchronization – i.e. the automatic downloading of data form only one control unit B to the disk of your computer. First, create a directory (e.g. C:\crs40) where you copy the previously downloaded files. Open the file **apator_metra_sync.bat** in any text editor, e.g. Notepad.

Encryption key synchronisation

```
@echo off
set LOGIN=test
set IP=10.0.1.28
set DESTDIR=.\metra
ping %IP%
mkdir %DESTDIR%
```

rsync -e "./ssh -i ./key_sync -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no" -av --delete %LOGIN%@%IP%:/var/metra/html/metra/ %DESTDIR%

pause

Synchronisation by name and password

@echo off

set LOGIN=test

set IP=10.0.1.28

set DESTDIR=.\metra

ping %IP%

mkdir %DESTDIR%

rsync -e "./ssh -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no" -av --delete %LOGIN%@%IP%:/var/metra/html/metra/ %DESTDIR%

pause

Edit the file as follows:

- <*set IP*> – replace it with the IP address of control unit B. The IP address can be found on the unit's identification label (Figure 8: Identification label of unit B)
- <*set DESTDIR*> – replace with the directory where you want to save the data downloaded from the control unit B. It is best to choose the directory name according to the name of the reading network (e.g. prazska12). The directory name must not contain spaces. You don't need to create the directory, it will be created automatically during synchronization.
- <set LOGIN> - the login name for access to the administration of this readout network (i.e., one unit B and several units A of the CRS 40). In case you forget your login name, you can have it sent together with your password to the e-mail address you entered in the e-mail in the e-mail address field for sending error messages.

Save the modified file – you can of course name it as you wish (you must keep the *.BAT extension). To perform the synchronization, just run the file. Before running the script, make sure you have a VPN connected.

If you use the encryption key synchronization, it will be done automatically, if you use a name and password, the script will prompt you to enter the password to access the reading network administration. If the name and password are valid, it will start downloading the data. Only new data (since the last synchronization) is downloaded.

If you are performing the first synchronization (possibly after a long time), it will take longer to download the data from the reading network controller. The nest time you synchronise, the program only downloads new readings. Do not close the text window during the synchronisation – it will be closed automatically when the download is complete.

If you want to work with the downloaded data, open directory where you saved the data (here C:\crs40\metra) and run the index.html file.

Synchronization can be done once every longer period of time, if you do this you will probably have more data available, in this case it would be advisable to use the sync.all.bat file. This scrip will perform the collation into a single file, this file will be transferred to the user and then extracted. If real-time backups are performed, there is no need to download all the data at once.

The first three lines of the file (set IP, set IP, set DESTDIR) must be filled in before starting such a synchronization.

```
@echo off

set LOGIN=test
set IP=10.0.1.28
set DESTDIR=.\metra
ping %IP%
mkdir %DESTDIR%
echo "Wait for a while packing files!"
ssh -i ./key_sync -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no %LOGIN%@%IP% tar czf
/var/metra/tmp/html.tar.gz -C /var/metra/html/metra/ . 2> nul
echo "Wait a moment, transfer files!"
rsync -e "./ssh -i ./key_sync -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no" -av --progress
--delete %LOGIN%@%IP%:/var/metra/tmp/html.tar.gz %DESTDIR%/
ssh -i ./key_sync -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no %LOGIN%@%IP% rm
/var/metra/tmp/html.tar.gz 2> nul
echo "Wait for a while unpacking files!"
gzip -d %DESTDIR%/html.tar.gz 2> nul
tar -xf %DESTDIR%/html.tar -C %DESTDIR%/ 2> nul
del %DESTDIR%\html.tar 2> nul
echo "Synchronization of %IP% completed!"

pause
```

11.2 ADVANCED SYNCHRONIZATION SETTINGS

The synchronization script can also be configured to synchronize with multiple reading networks in one run. Basically, it is a synchronization script copied multiple times in one file, with each copy of the script setting a different IP address of the reading network controller and a different directory to store the download data.

The B controllers that you want to synchronize at the same time must belong to the same network (see Chapter 9.1 VPN network structure for more information) and must have the public key file uploaded to them.

For bulk synchronization, the key synchronization option is recommended. When using name and password synchronization, you must enter the password for each reading network separately.

The synchronization script will look like this:

```
@echo off


set LOGIN=<login 1>
set IP=<assigned IP address 1>
set DESTDIR=<directory name 1>
ping %IP%
mkdir %DESTDIR%
rsync -e "./ssh -i ./key_sync -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no" -av --delete %LOGIN%@%IP%:/var/metra/html/metra/ %DESTDIR%


set LOGIN=<login 1>
set IP=<assigned IP address 2>
set DESTDIR=<directory name 2>
ping %IP%
mkdir %DESTDIR%
rsync -e "./ssh -i ./key_sync -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no" -av --delete %LOGIN%@%IP%:/var/metra/html/metra/ %DESTDIR%
...
set LOGIN=<login n>
set IP=<assigned IP address n>
set DESTDIR=<directory name n>
ping %IP%
mkdir %DESTDIR%
rsync -e "./ssh -i ./key_sync -o UserKnownHostsFile=./KnownHosts -o StrictHostKeyChecking=no" -av --delete %LOGIN%@%IP%:/var/metra/html/metra/ %DESTDIR%
pause
```

The recommendations from the previous chapter apply to editing and running the script.

12 SOLUTIONS TO THE MOST COMMON USER PROBLEMS

PROBLEM DESCRIPTION	RECOMMENDED SOLUTION
Connection to remote reading system not working	The remote connection of a computer to the reading network depends on the simultaneous operation of several links in the chain. A properly set up computer, a functional connection to the virtual private network and a properly functioning and configured controller B. So, first of all, check that your Internet connection is functional. Next, check that your virtual private network is set up correctly. You can check the functionality of the server that mediates your VPN connection by using the ping command (ping CRS 40) at the command prompt. Similarly, you can verify the functionality of the connection to unit B (ping [IP address of unit B]). In this case, you must be connected to the VPN
I don't get e-mail information messages from the meter reading networks	Check the correctness of the settings of the e-mail addresses for sending information mails (Settings: e-mail address for sending TXT files; Settings: e-mail address for sending error messages.
	Check the settings of the e-mail account for outgoing mail (Settings_ e-mail account for outgoing mail). If you are using APATOR METRA's SMTP server, it should be and e-mail address form a real domain (it also depends on you e-mail server settings – e-mail form non-existent internet domains are usually ignored). If you are using a different SMTP server Settings: SMTP server, check with you ISP for the reading unit.
	If you are not using the APATOR METRA SMTP server (Settings: SMTP server is filled in), check that the settings are correct. This server must normally be specified by the connection provider for the B control unit. This is not the SMTP server that you have set up in your mail program.
Synchronisation not working	First check the functionality of the connection to the reading network (see above). If the connection is set up correctly, check the syntax correctness of the automation script used to synchronize the data via rsync. If an SSH key is used, check its correctness or generate a new one.

13 ASSEMBLY REGULATION

13.1 General recommendations

Some recommendations are valid for all types of installations. Failure to follow them may result in a problematic installation.

1. Do not place Control Unit B in basements. Especially in multi-storey houses, the signal between the collection units A and the control unit B propagates through the open space by means of reflection.
2. Place CRS 40 units as close to windows as possible. This arrangement is preferable both in terms of the contact between the collection units A and the control unit B, and in terms of the signal interception of the units being read.
3. An exception may be a meter reading network in a single tower block. Here, it is preferable to install the CRS 40 units close to the central stairwell – if one exists and is not used or e.g. a lift.

13.2 Structural system TOXB

The recommended location of the A collection units is in the stairwell, vertically one floor above the mid-height of the building. The vertical reach of the collection units is a maximum of 6-7 storeys. The location of the B control unit is limited by the Internet connection, for example, a suitable location may be in the elevator machine room. The maximum distance A – B is approximately 4 entrances of and apartment building, the minimum distance should not be less then 5 meters. Conditions in a particular building may vary.