Manual EMU Professional II TCP/IP

Document Reference: 1475
Version: 1.6
Date: 27.05.2022

Inhaltsverzeichnis

| Doc. Ref	Version	Revision Date	Token	Changes
1476	V1.0	01.07.2021	fbo, met	Creation of document
1476	V1.1	13.10.2021	met	Further specification of time synchronization
1476	V1.2	14.03.2022	fbo	added requirements for updating
1476	V1.3	07.04.2022	met	update HTTP access. update data logger and logbook read-out
1476	V1.4	13.04.2022	met	update HTTP GUI description
1475	V1.5	11.05.2022	met	Rework of Doc.Ref numbers. Same document in different language no longer has a different Doc.Ref number
1475	V1.6	27.05.2022	fbo	remark about firmware-update

General

This document is a follow up for the EMU Professional II documentation (Doc.Ref 1451).

The EMU Professional II TCP/IP is equipped with a 10/100 MBit Ethernet-Interface and a RJ-45 connector. The energy meter automatically arranges the best speed with its remote station.

Ex-Factory the EMU Professional II obtains its IP-Address via a DHCP-request. The assigned IP-Address can be read out on the display of the meter under "Settings" -> "IP-Address". Navigate to "Settings" by pressing the "Arrow right" button and then use the "Arrow down" button to reach "IP-Address".

This document explains the method of accessing and configuring the EMU Professional TCP/IP via TCP/IP. Furthermore this document describes the read out of historical data. The output of such read outs is a CSV file, the structure of which is subsequently described. At the end of this document you will find a step-by-step guide to update the firmware via TCP/IP.

Connection Diagram TCP/IP
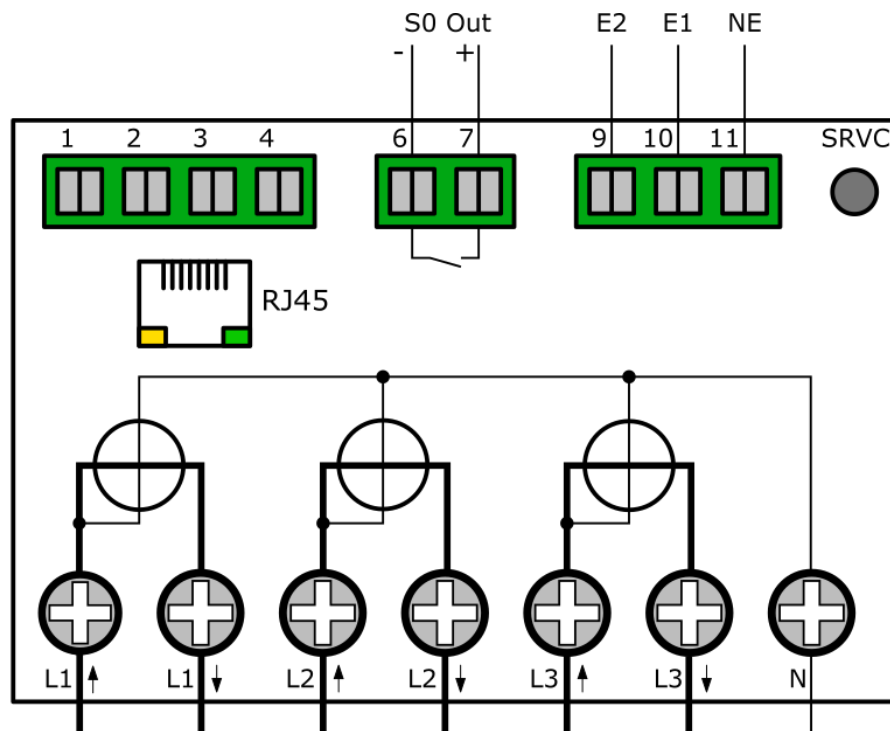
Access via HTTP

Once the EMU Professional II TCP/IP is connected to your network via an Ethernet cable you are able to reach it on a web browser. Access your meter with the following address:

http://[IP-Adress]/

The following interface appears once the above link is entered. At the very top you can switch between "Current Readings" and "Configuration"

Current Readings

This page shows the register values for Active Energy Import/Export as well as the momentary values of the Voltage, Active Power, Reactive Power, Current, Powerfactor and Frequency of the meter. These values are updated once every 5 seconds.

Configuration

The configuration page has the following configurations available:

- General Settings

  - DHCP: Choose between letting the meter request its own IP-Address or entering one manually.
  - If DHCP is not selected, you are required to enter the network parameters (IP-Address, subnet mask, gateway and DNS server) manually.

- Modbus TCP

  - Modbus active: Choose whether the Modbus server is turned on or not.
  - Port: Choose a TCP-Port over which the Modbus server accepts requests.

- NTP-Server

  - Time server: Enter the IP-Address or the DNS-name of a NTP-servers from which the EMU Professional II TCP/IP gets its time and date synchronization.

  If an NTP-server is set the communication module will try to get it's synchronization every 1-2 minutes. After the first successful synchronization the communication module requests interval changes once per hour.

  Note: The entered NTP-server must use a calibration valid time reference source.

  Note: In case the communication module cannot connect to the entered time server within 24h, it will display the message "NTP" on the display.

- Access Protection:

    ○ Activate: If you wish to secure your meter against unauthorized third parties you can chose the option "Activate". Make sure to enter your chosen password in the intended field and save the settings. Access to the EMU Professional II TCP/IP is now only possible via HTTP-Basic-Auth.

Note: If you select the option "Activate Password" but do not set a password, the meter will deactivate the password protection automatically.

- Deactivate: Schould you want to deactivate the password protection on your meter choose this option and save the change.
- Keep: If you want to change another setting but keep the password protection, choose this option before saving the settings.
- Allow Online-Updates: If you want to allow signed firmware updates from EMU Electronic AG please choose this option.

Save your settings by clicking on the "Save" button on the lower right hand side.

Reset

- In case of wrongly entered settings you can reset the TCP-configuration of the EMU Professional II TCP/IP. For this, navigate to the "Settings" menu on the EMU Professional II TCP/IP and from there to "TCP/IP Interface". Confirm the reset by choosing "Factory RESET".

- The option "Soft RESET" restarts the TCP-module of the energy meter and you will be able to redo all the above settings.

Note: Whichever RESET is done no meter reading, measurements, ongoing measurements or other processes relevant to calibration are changed.

Read-Out Data Logger

You can get the historical data of your EMU Professional II TCP/IP via the links at the bottom of the "Current Measurements" tab or by entering the following URL in your browser:

http://[IP-Address]/data/

If you specify no further parameters, the last 3000 entries are printed in descending order.

Note: Read-Out provides a maximum of 3000 entries per request, if more entries are required, the queries can be transmitted in staggered order.

Possible Parameters

To specify further which data points you want, you can add the following parameters to the URL (HTTP-GET).

Parameter	Description
last=x	Read-Out of the last x entries of the data logger
from=a	Start your read-out at index a
to=b	Stop your read-out at index b

If index a is less than index b, the data is read-out chronologically ascending. To receive a descending read-out, enter the bigger index first (a>b).

CSV-File Structure:

Column	Description	Unit	Resolution	Example Value
1	Timestamp	Epoch		2021-05-20T10:30:00Z
2	Index			2
3	Status			2
4	Serial number			12345678
5	Active Energy Import L123 T1	Wh	1 Wh	0
6	Active Energy Import L123 T2	Wh	1 Wh	0
7	Active Energy Export L123 T1	Wh	1 Wh	0
8	Active Energy Export L123 T2	Wh	1 Wh	0
9	Reactive Energy Import L123 T1	varh	1 varh	0
10	Reactive Energy Import L123 T2	varh	1 varh	0
11	Reactive Energy Export L123 T1	varh	1 varh	0
12	Reactive Energy Export L123 T2	varh	1 varh	0
13	Active Power L123	W	1 W	2985
14	Active Power L1	W	1 W	2010
15	Active Power L2	W	1 W	992
16	Active Power L3	W	1 W	0
17	Current L123	mA	1 mA	12982
18	Current L1	mA	1 mA	8682
19	Current L2	mA	1 mA	4300
20	Current L3	mA	1 mA	0
21	Current N	mA	1 mA	0
22	Voltage L1-N	V	0.1V	2326
23	Voltage L2-N	V	0.1V	2320
24	Voltage L3-N	V	0.1V	2304
25	Powerfactor L1		0.01	99
26	Powerfactor L2		0.01	99
27	Powerfactor L3		0.01	0
28	Frequency	Hz	0.1 Hz	500

Definition of the Status-Codes

The status code is bit-coded. The following table describes the status byte for binary, hex, and decimal read out.

Bit-Position	Bin	Hex	Dec	Description
0	0b00000000	0x0	0	No Change
0	0b00000001	0x1	1	Time changed
1	0b00000010	0x2	2	Current transformer ratio changed
2	0b00000100	0x4	4	Voltage transformer ratio changed
3	0b00001000	0x8	8	Impulse length changed
4	0b00010000	0x10	16	Impulse ratio changed
5	0b00100000	0x20	32	Power Failure
6	0b01000000	0x40	64	No time synchronization occurred
7	0b10000000	0x80	128	Logbook is full

Read-Out Logbook


```
Logbuchabruf
  letzten 2048 Einträge          /logbook/
  letzten 96 Einträge            /logbook/?last=96
  Eintrag 1 bis 100              /logbook/?from=1&to=100
  Eintrag 20 bis 1, absteigend   /logbook/?from=20&to=1
```

You can get the Logbook of your EMU Professional II TCP/IP via the following URL:

http://[IP-Address]/logbook/

If you specify no further parameters, the last 2048 entries are printed in descending order.

Note: Read-Out provides a maximum of 2048 entries per request.

Possible Parameters

To specify further which data points you want, you can add the following parameters to the URL (HTTP-GET).

Parameter	Description
last=x	Read-Out of the last x entries of the data logger
from=a	Start your read-out at index a
to=b	Stop your read-out at index b

If index a is less than index b, the data is read-out chronologically ascending. To receive a descending read-out, enter the bigger index first (a>b).

CSV-File Structure:

Column	Description	Unit	Resolution
1	Timestamp	Epoch	1 s
2	Timestamp after change	Epoch	1 s
3	Index		
4	Serial Number		
5	Active Energy Import L123 T1	Wh	1 Wh
6	Active Energy Import L123 T2	Wh	1 Wh
7	Active Energy Export L123 T1	Wh	1 Wh
8	Active Energy Export L123 T2	Wh	1 Wh
9	Index of corresponding load profile entry		
10	CT setting primary actual		
11	CT setting primary pre change(if)		
12	CT setting secondary actual		
13	CT setting secondary pre change(if)		
14	VT setting primary actual		
15	VT setting primary pre change(if)		
16	VT setting secondary actual		
17	VT setting secondary pre change(if)		
18	S0 pulse value actual	P/kWh	
19	S0 pulse value pre change(if)	P/kWh	
20	S0 pulse width actual	ms	
21	S0 pulse width pre change(if)	ms	

Firmware-Updrdenate

The EMU Professional II TCP/IP allows for firmware updates of its communication module via its built in "mcugmr-server".

You are able to access the update server once the configuration on the web interface is activated.

Note: Only signed update files from EMU Electronic AG are allowed.

Danger: Improper use or interrupting the firmware update can lead to damage to the EMU Professional II TCP/IP!

Danger: Updating is only possible if firmware-version is at least 1.0.6

Note: Updating the firmware of the communication module doesn't affect the firmware of the meter (FW-MID, FW-APP), also no meter reading, measurements, ongoing measurements or other processes relevant to calibration are changed.

Requirements

For an update under Windows 10, you can download the update tool incl. firmware here.
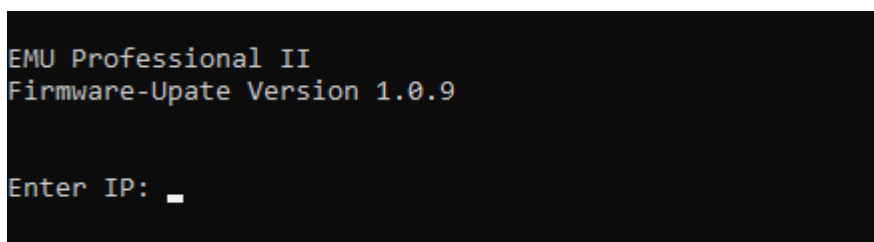
After downloading, the SHA256 hash of the mcumgr.exe file should be checked, this can be done with powershell as follows:

```
Get-FileHash .\mcumgr.exe –Algorithm SHA256
```

Output:

```
Algorithm       Hash
---------       ----
SHA256          311D5A72C040DFD0E1486B810B5E3EC32FE99A30CE245BF52C6C7B2B0EE8234E
```

By starting the file "update.cmd" the update process is started.

Example:

Manually execute the Firmware Update

The update is done via the command line tool mcumgr. For the installation go must be installed in advance.

After successful installation of "go", the latest version of mcumgr can be installed via the command prompt:

```
go get -v github.com/apache/mynewt-mcumgr-cli/mcumgr
```

Note: In the following example the EMU Professional II TCP/IP has the IP-Address 192.168.0.131 assigned.

1. Download the new firmware and validate the checksum.
2. Read out the current firmware version of your EMU Professional II TCP/IP with the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image list
```

The meter answers the following way. Version number and hash code may vary:

```
Images:
 image=0 slot=0
    version: 0.4.5
    bootable: true
    flags: active confirmed
    hash: xyz
Split status: N/A (0)
```

3. Upload the new firmware version with the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image upload [pathtoupdatefile.bin]
```

The meter will send the following loading bar as answer:

```
200.11 KiB / 200.11 KiB [=====...===] 100.00% 34.99 KiB/s 5s
Done
```

4. The following command lets you review the status of the uploaded images. You can review the old, as well as the new firmware.

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image list
```

"Slot=0" contains the data of the old FW version and "Slot=1" contains the data of the newly uploaded FW version:

```
Images:
 image=0 slot=0
    version: 0.4.5
    bootable: true
    flags: active confirmed
    hash: xyz
 image=0 slot=1
    version: 1.0.0
    bootable: true
    flags:
    hash: NewHash
Split status: N/A (0)
```

5. Confirm the new firmware. The identification of the firmware is done via its checksum/Hash code. Use the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image test
```

The meter answers with the following data:

```
Images:
 image=0 slot=0
    version: 0.4.5
    bootable: true
    flags: active confirmed
    hash: xyz
 image=0 slot=1
    version: 1.0.0
    bootable: true
    flags: pending
    hash: NewHash
Split status: N/A (0)
```

The new firmware has the flag "pending".

6. Restart the TCP/IP module of the EMU Professional II TCP/IP with the following command line argument. After the successful restart of the TCP module the meter switches the old for the new firmware and starts up with the new firmware. Wait until the meter has received an IP-Address again before continuing with step 7.

```
mcumgr --conntype udp --connstring=192.168.0.131:1337  reset
```

7. Confirm the permanent change to the new firmware with the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image confirm NewHash
```

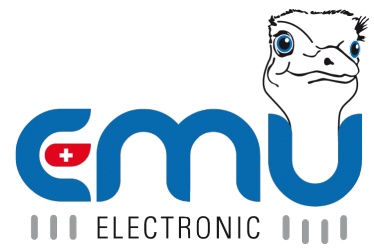8. Delete the old firmware.

Note: Deleting the old firmware is not mandatory. The firmware update is finished with step 7. This allows for switching between the two versions at any time.

Note: Please be advised that the EMU Professional II TCP/IP can only store 2 firmware images at any time. If both slots are full you will not be able to upload a new firmware update until you deleted one of the existing images!

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image erase
```

The firmware update is finished successfully.