Integration of the Ampio system with Node-RED

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Description of Node-RED features: Node-RED is a data flow programming tool that allows you to easily create interactions between different devices and services. You can use it to integrate with smart TV, TEDEE lock, etc.
Risk warnings: Node-RED is a programming tool that requires adequate technical knowledge. It is the responsibility of the user to understand the logic of the programme created in Node-RED.
No technical support for application logic: Ampio does not provide technical support or any guarantees regarding the logic of user-created flows in Node-RED. It is a tool provided at the responsibility of the installer.
Liability for errors and losses: Ampio is not responsible for errors in the application logic, nor for any losses resulting from the use of Node-RED.
Encouraged testing: We encourage you to conduct small-scale testing before fully implementing a Node-RED-based project. This will help minimise potential risks.
Provision of helpful knowledge sources: We provide Node-RED documentation and other educational materials that can help you understand and use the tool effectively.
Please read the manual with understanding before using Node-RED. If you have any questions, please consult technical support.

Launching the Node-RED interface

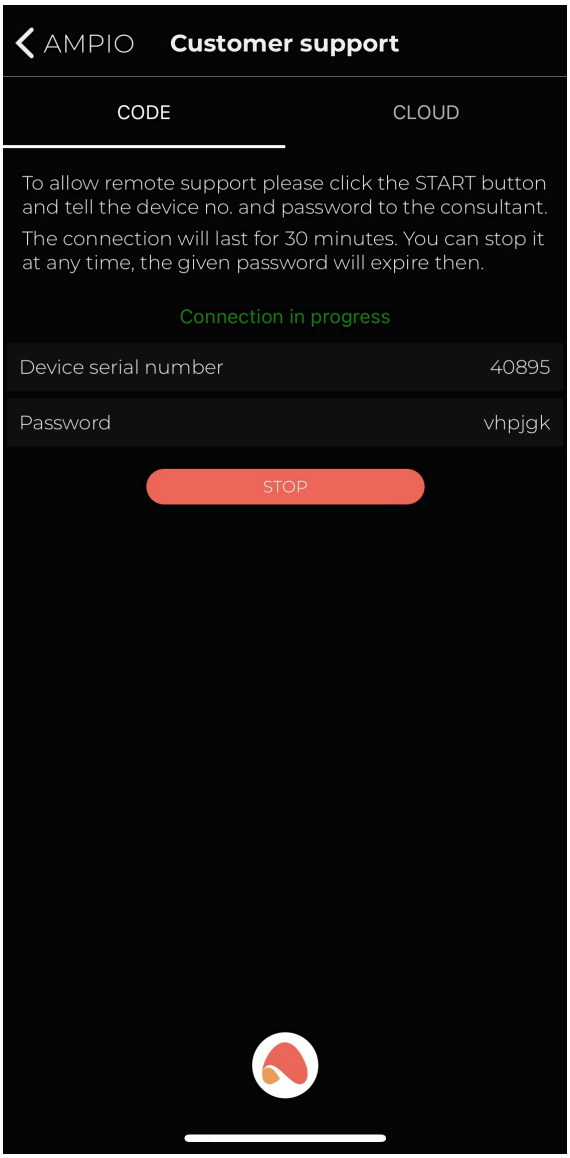
Locally

To take advantage of the integration of the Ampio system and the Node-RED platform, you need to know the IP address of the server and the password of the user admin and run the interface via a browser.

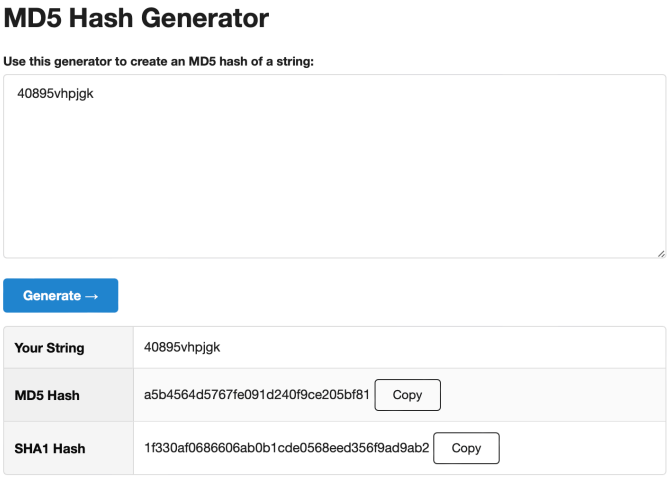
You will find the interface of the Node-RED platform on port 1880 on the M-SERV module by typing IP:1880 into the browser (e.g. 192.168.1.2:1880).

Via the cloud

To run Node-RED via the cloud, you generate a serial number and password from within the Ampio UNI application. Click on the logo at the bottom of the screen, select *Customer Support*, and click *START*.



Next, find any page with the MD5 Hash Generator in a web browser, and enter the application-generated serial number and password in a single string.



Copy the generated MD5 Hash.

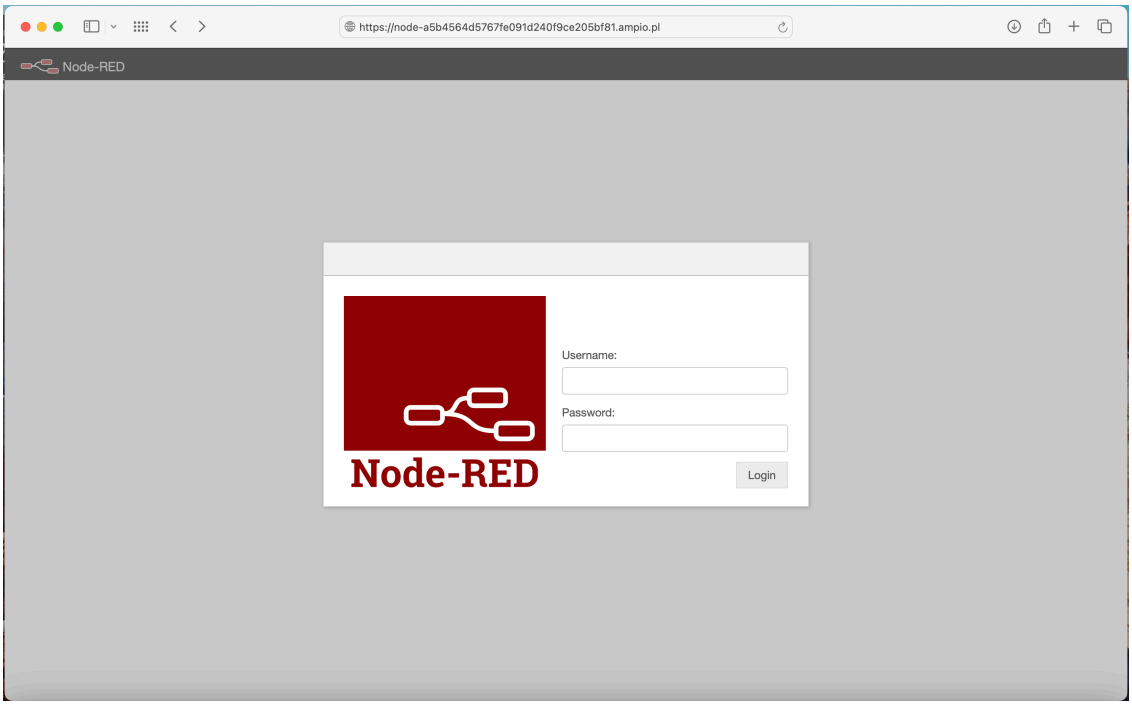
To access Node-RED remotely the following link must be used:

https://node-[generated MD5 Hash].ampio.pl

In our case:

https://node-a5b4564d5767fe091d240f9ce205bf81.ampio.pl

This is the address you need to paste into your browser:

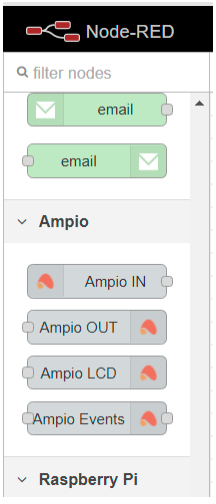


Integration via predefined nodes

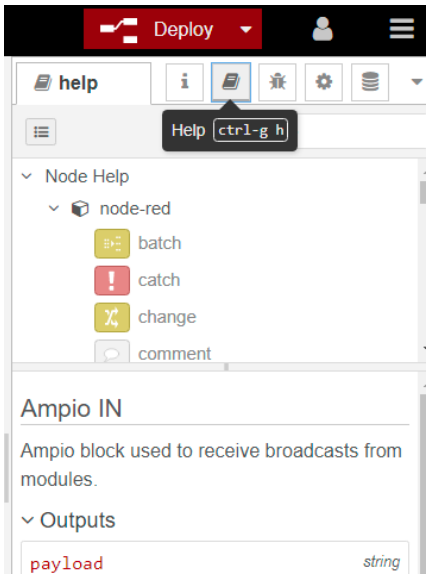
In order to use the functionality of integration between the Ampio system and Node-RED, you have to launch the interface in your browser and provide the server IP address, as well as the admin's password.

The Node-RED interface can be accessed on M-SERV via port 1880 by entering IP:1880 (e.g. 192.168.1.2:1880) into the browser.

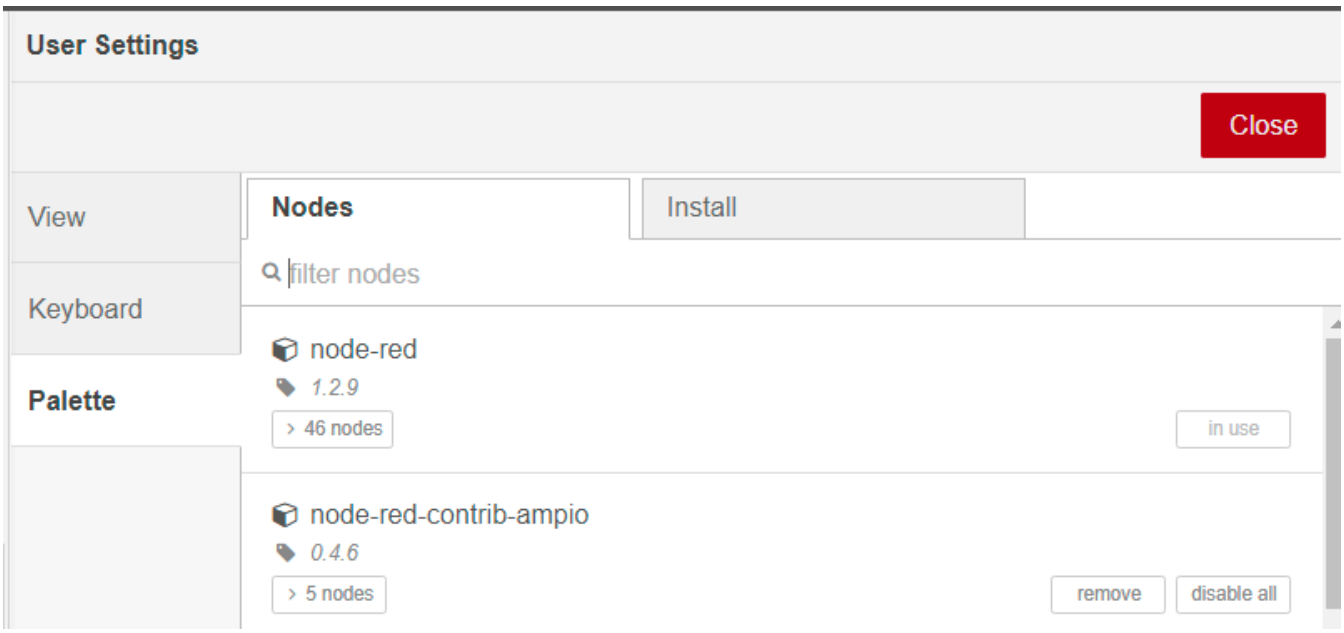
A selection of Node-RED nodes is on the left side of the interface, where you can also find Ampio's predefined nodes that will facilitate creating dependencies.



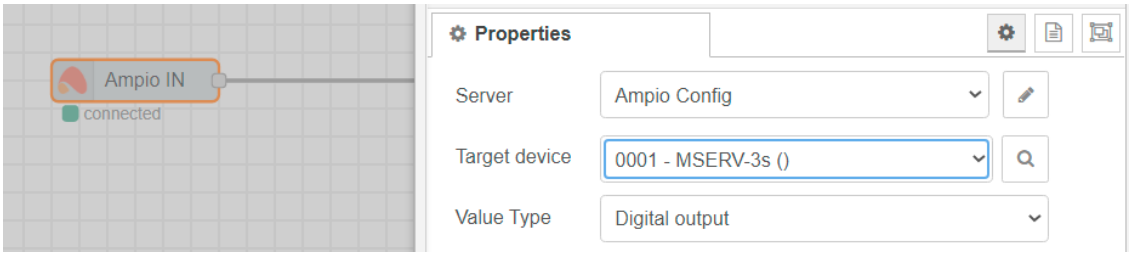
Each of the nodes has its own guideline in the Help tab.



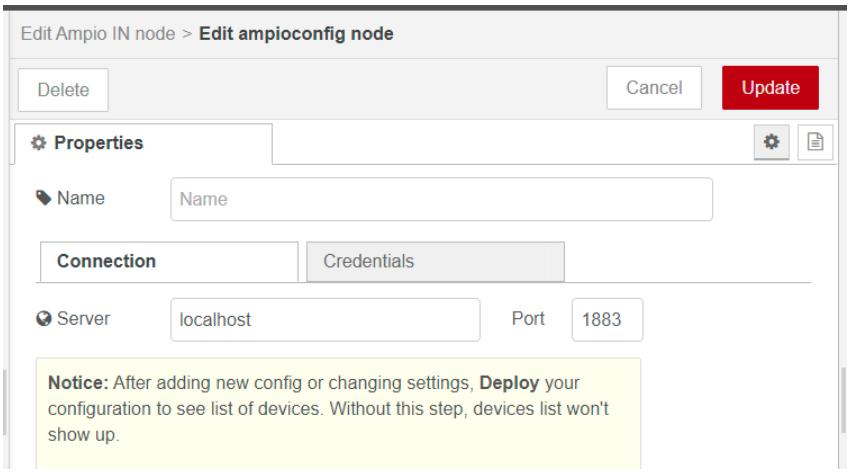
In order to ensure that the node-red-contrib-ampio library is up to date, enter Menu Manage palette and check whether an update is available, or not. If an update is performed, you must reset the server.



After using the first node from the Ampio library, it is worth it to perform a *Deploy* in order to check whether the node changed its status to *connected*, or not. Then, the node's menu should be open, the magnifying glass icon selected and within 15 seconds a list of your devices should be displayed.



If the node does not have a *connected* status, it might be necessary to configure it. Select the edit option right next to the *Server* field (the pencil icon). In the *Connection* tab in the *Server* field, enter the localhost, leave the port at 1883. In the *Credentials* tab, enter the login details from your Ampio www server.

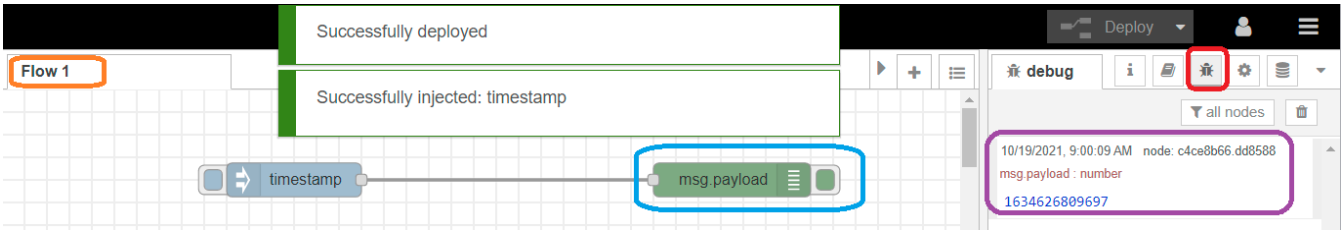


Once that is complete, click on *Update*, then *Done* and perform a *Deploy*.

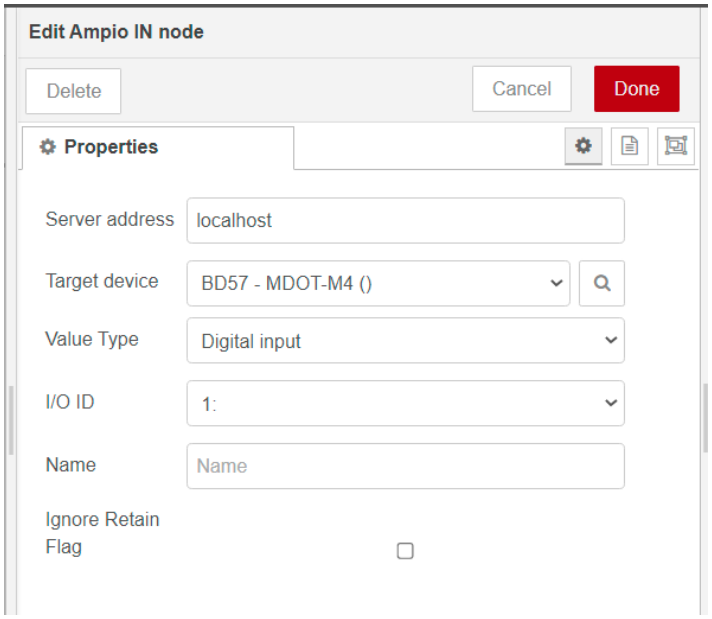
Code testing

Node-RED enables code debugging and displaying information (data) on the right side of the interface. Examples are provided below:

- orange – Flow name
- red – activation of the debug tab
- blue – a node allowing for displaying information in debug
- purple – data displayed in the debug option



Ampio IN node -- obtaining information from inputs

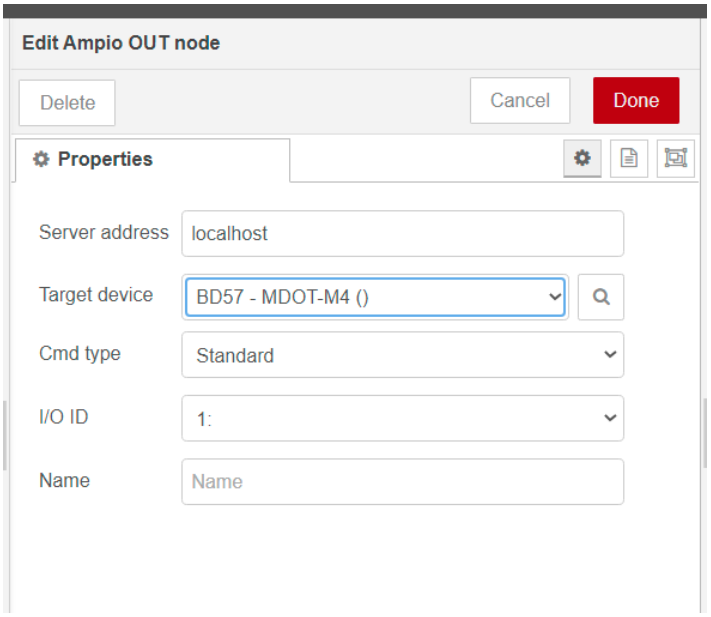


Parameters:

1. Server address – server's IP address; if Node-RED is on the server, select Ampio Config or localhost
2. Target device – a device in the CAN network with a unique MAC address
3. Value Type – used for the selection of the type of values that are received from the device. Select types from the following list:
    - Analogue value
    - RGB color
    - Digital input
    - Digital output
    - Flag
    - Temperature
4. I/O ID – the device's input or output number
5. Optionally, you may add a name for the node in the Name field.

If the Ampio IN node is configured correctly, you will see "connected" under the node.

Ampio OUT node -- output control

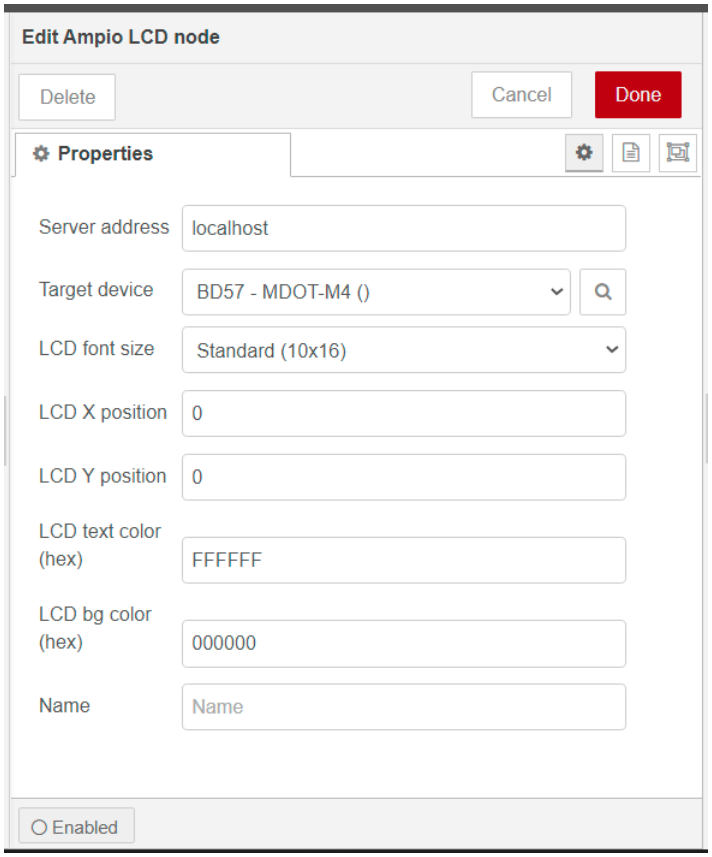


Parameters:

1. Server address – server's IP address; if Node-RED is on the server, select Ampio Config or localhost
2. Target device – a device in the CAN network with a unique MAC address
3. Cmd Type – used for the selection of the type of values that you want to control. Select types from the following list:
    - Standard – binary and analogue outputs
    - RAW CAN broadcast – RAW type is used for the control of raw data included in a separate CAN network documentation.
    - Digital input
    - Digital output
    - Flag
    - Temperature
4. I/O ID –the device's input or output number
5. Optionally, you may add a name for the node in the Name field.

If the Ampio OUT node is configured correctly, you will see "connected" under the node.

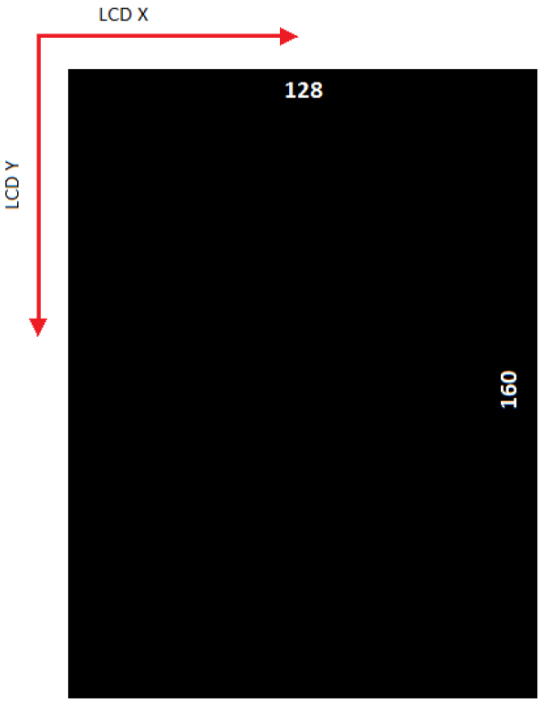
Ampio LCD node -- displaying information on M-DOT panels



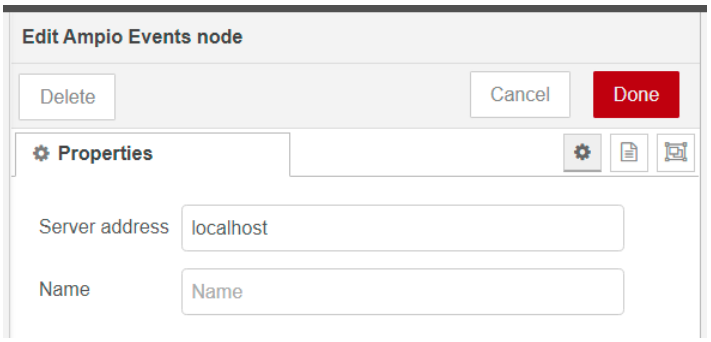
Parameters :

1. Server address – server's IP address; if Node-RED is on the server, select Ampio Config or localhost
2. Target device – a device in the CAN network with a unique MAC address
3. LCD font size – selection of a font between Standard (10×16), Big (20×32) and Icon (40×40). The last type is available only, if icons have been loaded onto the panel.
4. LCD X position – beginning of a text line, X coordinate
5. LCD Y position – beginning of a text line, Y coordinate
6. LCD text color – hexadecimal text colour
7. LCD bg color – hexadecimal background colour
8. Name – optional name

The starting point is the top left corner of the screen. Its coordinates are LCD X=00 and LCD Y=00. Increasing the LCD X value will move the text towards the right side. Increasing the LCD Y value will lower the text, as shown below.



Ampio Event node -- broadcasting events to or from the Ampio system



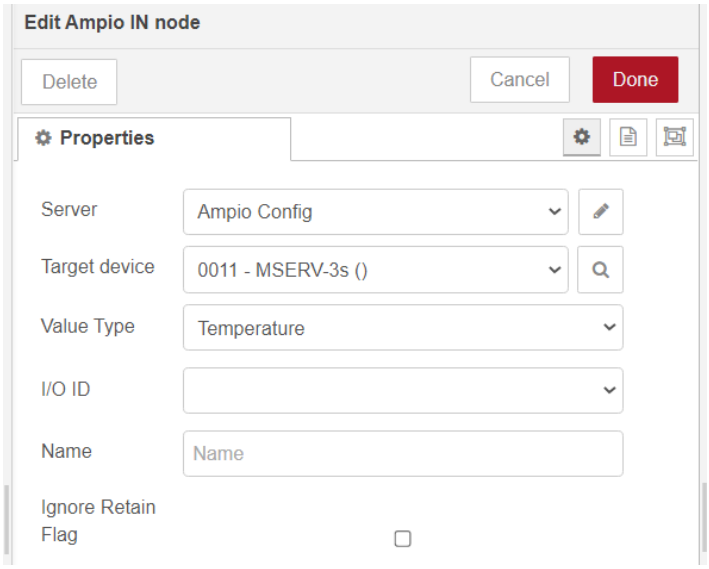
Parameters:

1. Server address – server's IP address; if Node-RED is on the server, select localhost
2. Name – optional name

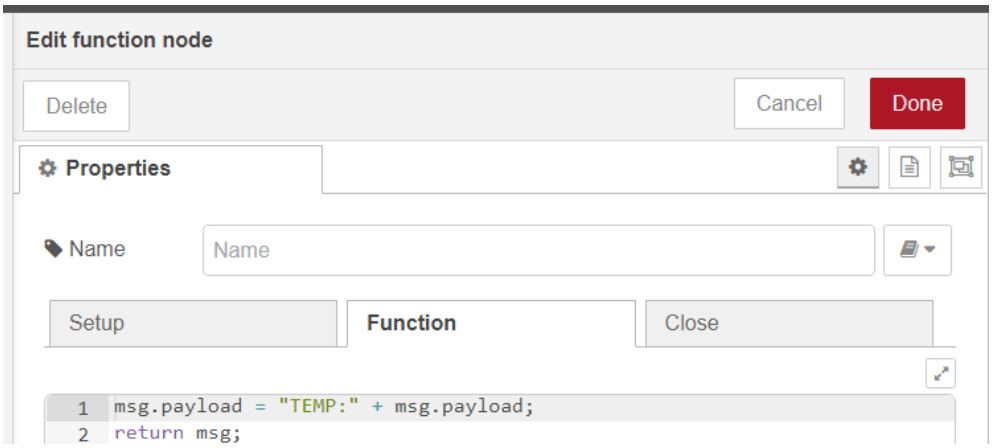
An example of usage

Here, we present an example of how to obtain the temperature from an Ampio module and display it, together with a description, on an M-DOT panel.

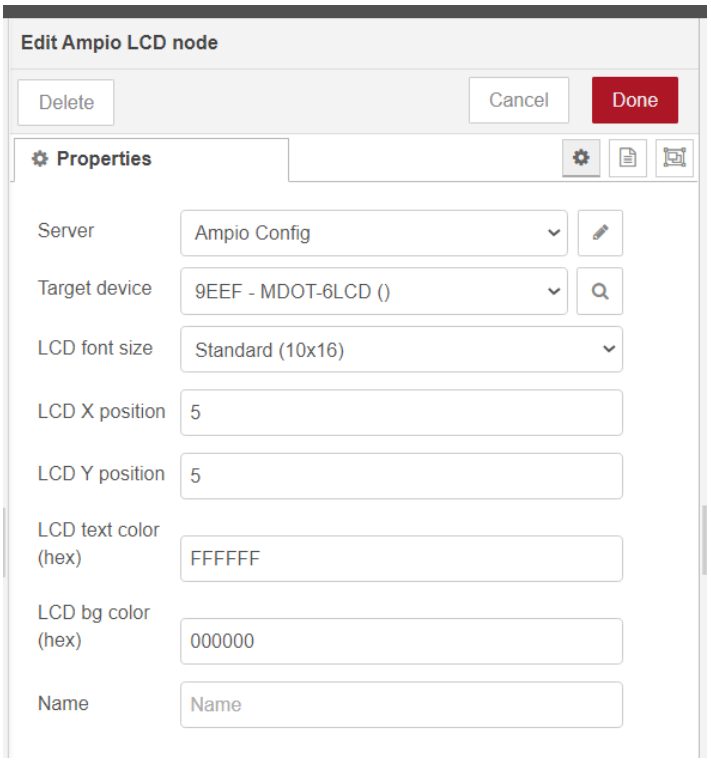
In the Ampio IN node, select, from which module you would like to get the temperature values, set the value type and the sensor's ID.



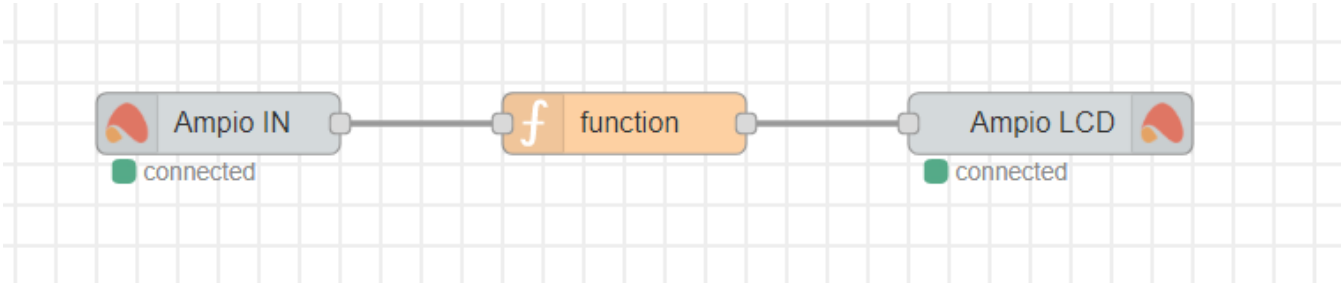
In the functional block, add a description using the Javascript language.



In the Ampio LCD node, select the M-DOT module and set up the position of text, the font size and colour, as well as the background colour.



Connect the nodes and click deploy.

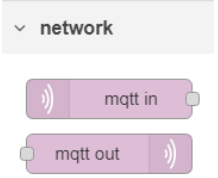


The settings presented above will give you a white text ” TEMP: *temperature value*” in the middle of the screen on black background.

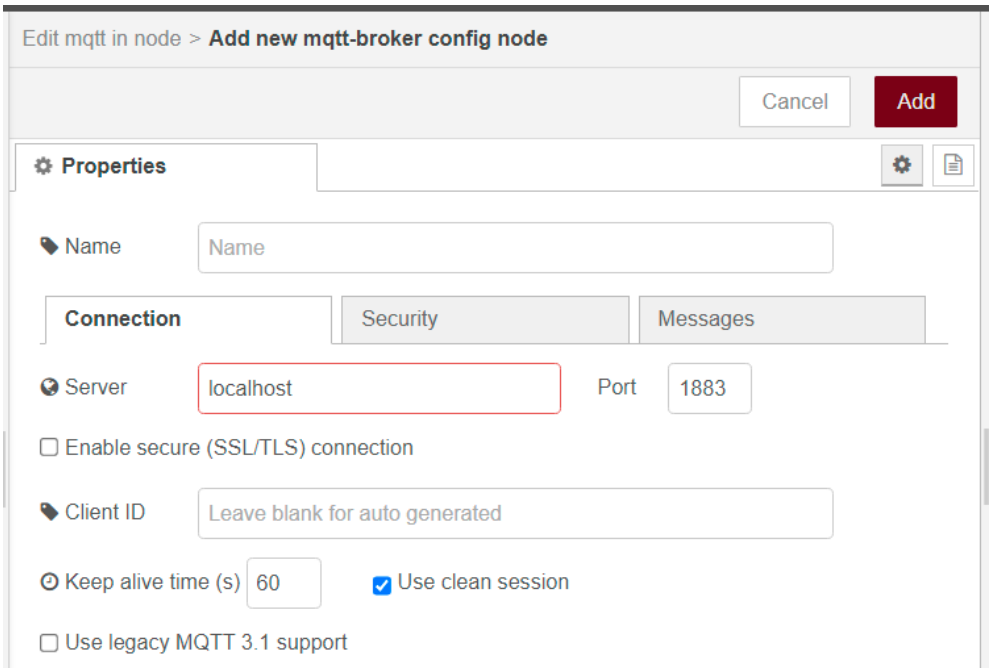
Integration via the MQTT broker

There is a possibility of integrating the Node-RED platform with the Ampio system without using predefined nodes. An MQTT broker will let you do that. With MQTT you can also track more events in the CAN network and control more advanced functions.

In order to do that, use nodes *mqtt in* and *mqtt out*.



If you are using Node-RED installed on the M-SERV module, enter *localhost* in server properties. In other cases, credentials for login are the same as the ones used for the Smart Home Manager application and the server is provided with the use of an IP address. Once you are done, click on Add, Done and Deploy.



MQTT topic

Communication with the MQTT broker is mostly two-directional (*from* and *to*). A topic that begins with *ampio/from* allows for checking the status of devices. A topic that begins with ampio/to is used to control devices.

Examples of ampio/to usage:

`ampio/to/<mac>/cmd` – run the command

`ampio/to/<mac>/raw` – raw data frame

`ampio/to/can/dev/list` – a list of devices in the CAN network

`ampio/to/event` – broadcast the event

A list of commands:

Command	Topic	Payload
set a single output	`ampio/to/<mac>/o/<nr>/cmd`	on,off; 0..255
RGB	`ampio/to/<mac>/rgbw/<nr>/cmd`	off; 0..255,0..255,0..255 (on – for it to work)
RGBW	`ampio/to/<mac>/rgbw/<nr>/cmd`	off; 0..255,0..255,0..255,0..255 (on – for it to work)
roller blinds	`ampio/to/<mac>/o/<nr>/cmd`	0 – STOP; 1 – DOWN; 2 – UP
flags	`ampio/to/<mac>/f/<nr>/cmd`	on,off; 0..255
MRT- temperature	`ampio/to/<mac>/rs/<nr>/cmd`	-99.9..155.0
MRT-temperature day/night	`ampio/to/<mac>/rsdn/<nr>/cmd`	temperature_day, temperature_night (example: 19,20)
MRT- operating mode	`ampio/to/<mac>/rm/<nr>/cmd`	0 – calendar; 1 – MANUAL; 2 – MANUAL2; 3 – holidays; 4 – block

Examples of the `ampio/from` topic:

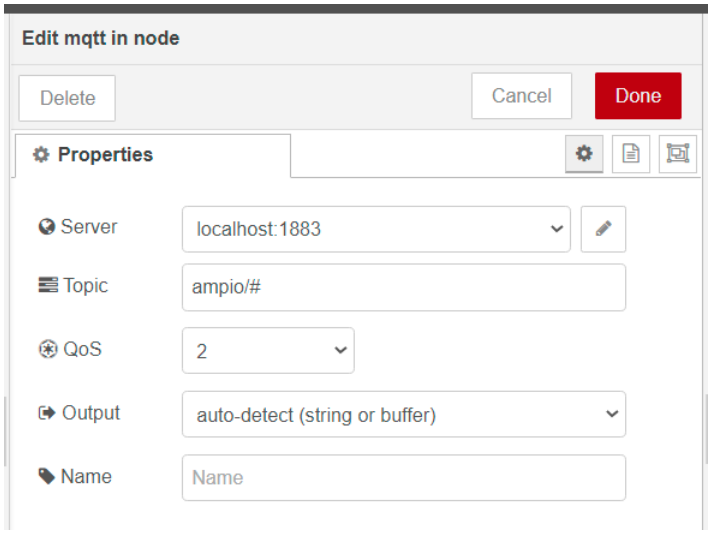
Type	Topic	Payload string	Payload example
temperatures	`ampio/from/<mac>/state/t/<nr>`	-99.9 to 1000.0 (even more)	21.5
binary input	`ampio/from/<mac>/state/i/<nr>`	0 or 1	1
binary output	`ampio/from/<mac>/state/o/<nr>`	0 or 1	1

Type	Topic	Payload string	Payload example
analogue input	`ampio/from/<mac>/state/a/<nr>`	0 to 255	0
binary input extended	`ampio/from/<mac>/state/bi/<nr>`	0 or 1	0
binary output extended	`ampio/from/<mac>/state/bo/<nr>`	0 or 1	0
rgb	`ampio/from/<mac>/state/rgb/<nr>`	0..255,0..255,0..255	128,220,13
flags	`ampio/from/<mac>/state/f/<nr>`		
line 8-bit flags	`ampio/from/<mac>/state/afu8/<nr>`	0..255	
line 16-bit flags	`ampio/from/<mac>/state/afi16/<nr>`	-32768..32767	
MRT – temperature	`ampio/from/<mac>/state/rs/<nr>`	25.5	
8-bit analogue values (DALI, LED)	`ampio/from/<mac>/state/au/<nr>`	0…255	234
16-bit analogue values (signed)	`ampio/from/<mac>/state/au16/<nr>`	0…65536	
16-bit reduced by 10K	`ampio/from/<mac>/state/au16l/<nr>`	0…6553.6	23.4
32-bit values, e.g MODBUS	`ampio/from/<mac>/state/au32/<nr>`	0…4 294 967 296	1234

If it is not indicated which data type should be used to send the values, the information is sent with the *string* type.

MQTT test

If you want to check all the available information in the system, use the *mqtt in* node, set the topic to `ampio/#` and connect debug. Then, click Done and Deploy. The data should appear in the debug window.



If you would like to check the data from one, selected module, set the topic to `ampio/from/MAC/#` (e.g. `ampio/from/ABCD/#`).

MAC address should always be entered without leading zeros.

Checking statuses

Always use the local MAC address to control modules.

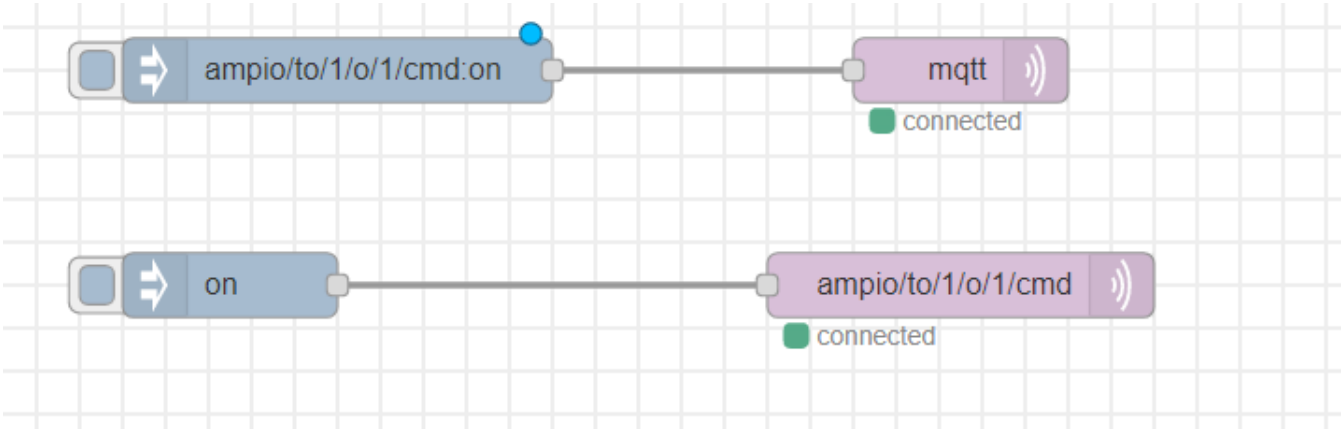
If you want to check the status of a field in an M-DOT module, set the topic to: `ampio/from/3910/state/i/1`, where:

- from stands for the direction,
- 3910 is a MAC address,
- state stands for checking the current status,
- 1 stands for the number of an input (M-DOT field 1)

Controlling outputs

In order to activate the first output in a device with the MAC address ABCD, set the topic to: ampio/to/ABCD/o/1/cmd , and payload to: on.

Both options presented below will bring the same result:



M-DOT control

Apart from controlling outputs with commands, there is also a possibility to create own texts on the M-DOT display with the use of API commands. In order to use them, select the topic `RAW`. It might be necessary to update the software of the M-DOT module.

Control via API can be divided according to different LCD displays' dimensions, as follows:

> The term API is used in this guide in the context of sending commands from the MQTT broker to the touch panel display. It is not an API related to HTTP commands.

M-DOT-M18 and M-DOT-M6 (from pcb 8) -- resolution 240×320

Commands to be displayed (for multi-screen displays):

- 1E 01 – change the screen number (e.g. 1E 01 05 – change the screen to number 6)
- 1E 02 xx yy yy...- set text (small row), on screen nr xx to caption yy yy...., max. 12 characters
- 1E 03 xx yy yy...- set text (big row), on screen nr xx to caption yy yy...., max. 9 characters

> The above character writing functions only work on screens of type *Four icons and content*. For them to work properly, the *Actor* fields in the settings of the respective screen must not be empty.

Functions not related to screens, always overwriting the current screen:

- 29 03 – clear the screen
- 29 14 xa xa ya ya xs xs ys ys ff ff cc cc – draw a frame on the screen, (xa xa – starting point on the X-axis, ya ya – starting point on the Y-axis, xs xs – x dimension, ys ys – y dimension, ff ff – frame width, cc cc – frame colour)
- 29 0C xa xa xz xz ya ya yz yz cc cc – draw a rectangle on the screen, (xa xa – starting point on the X-axis, xz xz – end point on the X-axis, ya ya – starting point on the Y-axis, yz yz – end point on the y-axis, cc cc – frame colour)
- 29 18 xx xx yy yy cc cc bb bb zz zz zz zz zz – insert text in font 40×64 (xx xx – starting point on the X-axis, yy yy – starting point on the Y-axis, cc cc – text colour, bb bb – background colour, zz – max. 6 characters, only 0-9 and $, – . / : + -)

- 29 13 xx xx yy yy cc cc bb bb zz zz zz zz zz – insert text in font 26×48 (xx xx – starting point on the X-axis, yy yy – starting point on the Y-axis, cc cc – text colour, bb bb – background colour, zz – max. 9 characters)
- 29 12 xx xx yy yy cc cc bb bb zz zz zz zz zz – insert text in font 20×32 (xx xx – starting point on the X-axis, yy yy – starting point on the Y-axis, cc cc – text colour, bb bb – background colour, zz – max. 12 characters)
- 29 11 xx xx yy yy cc cc bb bb zz zz zz zz zz – insert text in font 10×16 (xx xx – starting point on the X-axis, yy yy – starting point on the Y-axis, cc cc – text colour, bb bb – background colour, zz – max. 24 characters)
- 29 15 xa xa ya ya cc cc bb bb ic – draw an icon (from M-DOT's memory, uploaded through the configurator), ic – icon's number, xa – starting point on the X-axis, ya – starting point on the Y-axis, cc cc – icon's colour, bb bb – background colour

For example, sending:

msg.topic = ampio/to/ABAB/raw msg.payload = "1E030030313031303130313031";

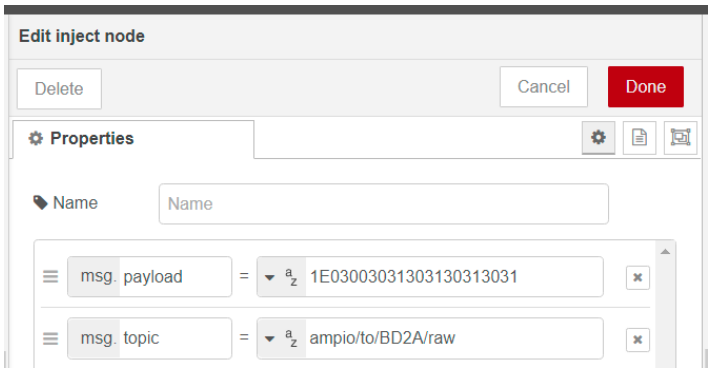
changes the big row to 1 and 0 (in accordance with the ASCII code) on M-DOT with the MAC address ABAB.

Sending msg.payload = "2918000000003344AABB30313233" will return 0123 on the screen in specified colours.

> Note: please mind the bit significance – LSB/MSB. Colours are coded in RGB565 standard, after generating colour codes it may be necessary to change the byte order.

Sending 291251000001… will start writing from 81 on the X-axis and 256 on the Y-axis. It is worth using a Windows calculator in a programmer mode for the calculations (hex 51 gives decimal 81, hex 100 gives decimal 256).

Sending 290C0000EF006A00D300000000 will draw a black rectangle extending over the whole width of the screen, between 1/3 and 2/3 of its height (it is the second row for the option 3 text rows).



Other M-DOT modules with smaller displays -- resolution 128×160

- 29 01 07 xx yy cc cc bb bb nn zz zz zz.. – insert text – small row, max. 11 characters (xx – x position, yy – y position, cc cc – text colour, bb bb – background colour, nn – number of characters, zz zz … – characters in Windows-1250 format)
- 29 01 09 xx yy cc cc bb bb nn zz zz zz.. – insert text – big row, max. 6 characters (xx – x position, yy – y position, cc cc – text colour, bb bb – background colour, nn – number of characters, zz zz … – characters in Windows-1250 format)
- 29 01 03 – clear the screen
- 29 01 04 xa ya xz yz c1 c2 – draw a rectangle in a specified colour (xa – starting point on the X-axis, ya – starting point on the Y-axis, xz – end point on the X-axis, yz – end point on the Y-axis, c1 + c2 – rectangle colour 2-byte)
- 29 01 0A ic xa ya cc cc bb bb – draw an icon (from the M-DOT's memory, uploaded in the configurator), ic – icon number, xa – starting point on the X-axis, ya -starting point on the Y-axis, cc cc – icon colour, bb bb – background colour

2-byte colours are saved in an RGB565 format.

Multisensor M-SENS

Data that can be read from multisensor M-SENS:

- Humidity: `ampio/from/<mac>/state/au16l/1`
- Absolute pressure: `ampio/from/<mac>/state/au16l/2`
- Volume: `ampio/from/<mac>/state/au16l/3`
- Brightness: `ampio/from/<mac>/state/au16l/4`
- Air quality: `ampio/from/<mac>/state/au16l/5`
- Relative pressure: `ampio/from/<mac>/state/au16l/6`
- Temperature: `ampio/from/<mac>/state/t/1`

Raw function

Some of the control functions in Node-RED are made available through the RAW function.

The control topic is as follows: ampio/to/mac_adress/raw.

Below, you will find a list of examples of the functions that can be managed with the RAW topic:

Switching on/off binary flags for a specific time

Payload description:

- D0 - 0x01 - sterowanie flagami
- D1 - 0x00 - sterowanie flagami czasowe
- D2 - FLAG_MASK[0] - flag mask
- D3 - FLAG_MASK[1] - flag mask
- D4 - FLAG_MASK[2] - flag mask
- D5 - FLAG_MASK[3] - flag mask
- D6 - value to be set 0-turn off, 1..255 - turn on
- D7 - TIME[0] time to turn on/off [10ms] for time 0 it remains switched on/off permanently
- D8 - TIME[1] time to turn on/off [10ms] for time 0 it remains switched on/off permanently
- D9 - TIME[2] time to turn on/off [10ms] for time 0 it remains switched on/off permanently

Example: turns on flag 1 for 2 seconds in a device with the MAC=30EE

topic: ampio/to/30EE/raw

payload: 010001000000FFC80000

Controlling simple RGBW and RGB

Payload description:

- D0 - 0x02 - output control
- D1 - 0x00 - output control simple RGBW
- D2 - R
- D3 - G
- D4 - B
- D5 - W

Example: set a specific colour

set: mac=33CD, colour R=255, G=255, B=0, W=0;

topic: ampio/to/33CD/raw

payload: 0200FFFF0000

Controlling 8-bit line flags unsigned (0-255)

Payload description:

- 7A - 8bit line flags
- F9 - set the number to value
- 80 - a value set in a hexadecimal format
- 00 - flag number 0..17

Example: Ustaw flagę 0 na wartość 128.

topic: ampio/to/1907/raw

payload: 7AF98000 (string)

Controlling 16-bit line flags unsigned (0-65535)

Payload description:

- 79 - 16bit line flags
- F2 - set the number to value
- 34 - the less significant byte value to be set
- 12 - the more significant byte value to be set
- 00 - flag number 0

Example: Set the 0 flag to the value 4660.

topic: ampio/to/1907/raw

payload: 79F2341200 (string)

Controlling roller blinds in modules that have an association functionality (relays/blinds)

Payload description:

- 31 - controlling the roller blind
- F9 - set a number to value
- 02 - open (00 - stop, 01 - close, 02 - open)
- 00 - the roller blind's number from 0

Example: Open the first roller blind.

topic: ampio/to/1907/raw payload: 31F90200 (string)

Overwriting the state of a roller shutter without controlling it

Payload description:

- 31 - roller shutter control
- E0 - roller shutter (E1 - slat)
- 02 - number of roller shutter (numbering from 0)
- 00 - roller shutter percentage (0-100%)

Example: Roller shutter number 3 at 0 percent.

topic: ampio/to/1907/raw payload: 31E00200 (string)

Broadcasting temperature from an external sensor (with an assigned MAC address within the range of 0-fff) into the bus

The function works in the MQTT broker version 4.25.1.

Payload description:

- 22 - an example of the temperature

Example: Broadcast the temperature of 22 degrees as 11001055 address into the bus.

topic: ampio/to/broadcast/55/t payload: 22 (number)

> Please, bear in mind that not all modules support the above-mentioned functionalities. We recommend checking in the Ampio Designer whether a given module supports, for example, 16-bit flags, or not.