COM HUB SYNC PLC USER MANUAL

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1 CONTENT

2 REFERENCE DOCUMENTS

No.	Document Name	Notes
[1]	SDLC_Module_User_Manual	SDLC Module Manual
[2]	Full_ Sensor Documentation_Traffic Management_TRUGRD_Products	UMRR12 Manual
[3]	J-Box_Accessory_Datasheet.pdf	J-Box Datasheet
[4]	TAFFIC_WEB_UI_Traffic_Management.pdf	Traffic WEB UI Manual
[5]		

Table 1: Reference documents

3 PRODUCT SPECIFICATIONS

The smartmicro COM HUB Sync PLC is a high-performance edge computer with a built-in interface panel. It enables the connection and time synchronization of up to 6 smartmicro sensors via Power Line Communication (PLC) interface.

FEATURES

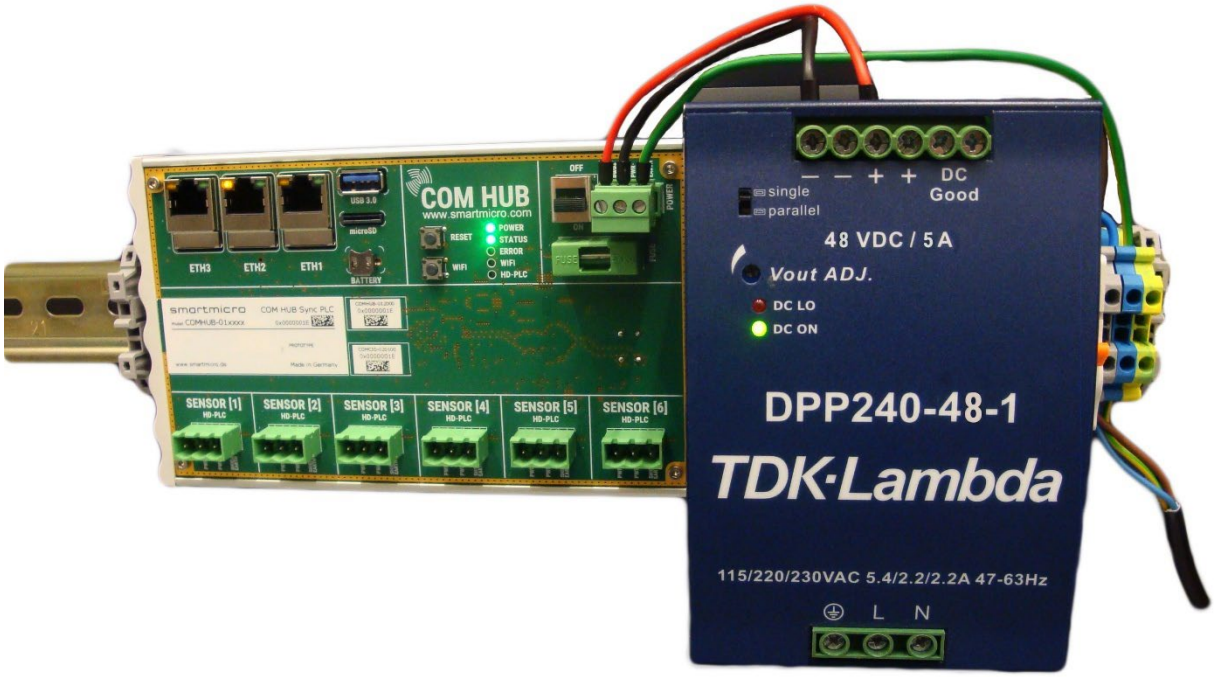
The COM HUB PLC Module has the following features:

- Built-in surge and power protection
- On/off switch and resettable fuse for the main DC power supply
- Six PLC Ethernet interfaces for sensors
- Three high speed Ethernet interfaces for external modules such as SDLC module or V2X Module
- WIFI communication with on/off button and automatic turn-off feature
- SD Card and USB 3.0 interfaces for additional mass storage devices
- Real-time clock option
- Pluggable terminal blocks for power and data interfaces
- DIN rail mounting

In addition to the features above, the COM HUB Sync PLC assembly consist of the following components:

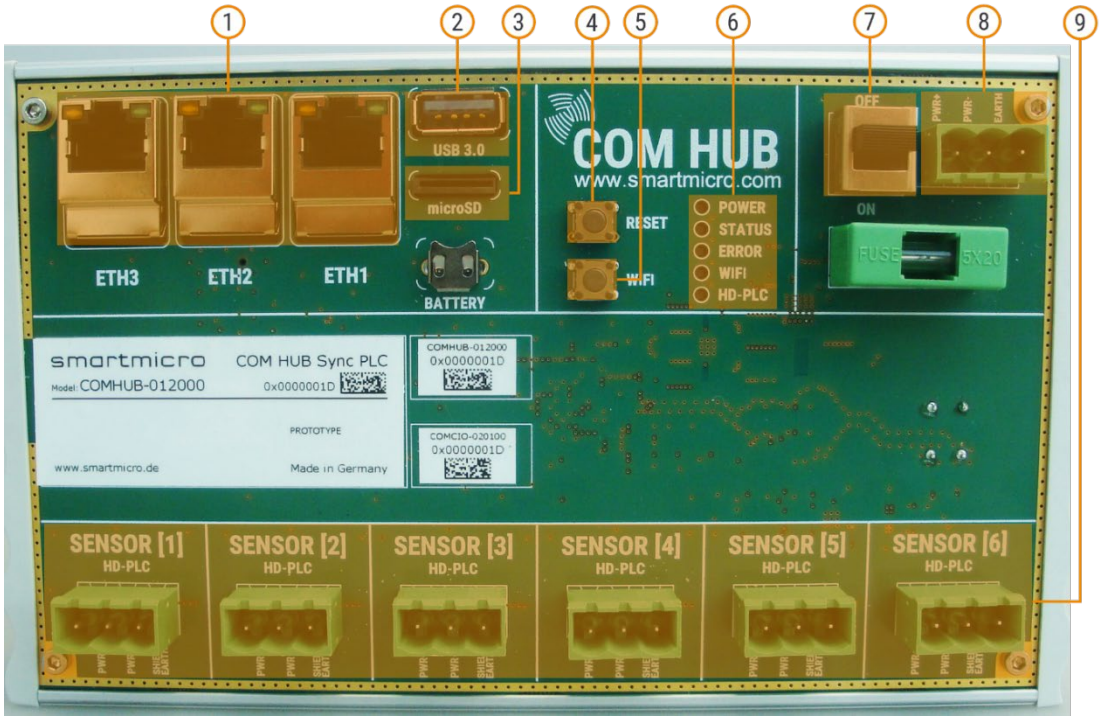
- Circuit breaker
- Power supply
- Pre-wired power cables
- Terminal blocks for the main AC power supply
- DIN rail
- Grounding for all parts including the DIN rail

4 COM HUB SYNC PLC



The smartmicro COM HUB Sync PLC is a high performance edge computer connected to an interface panel to enable the connection and time synchronization of up to six smartmicro sensors via HD PLC (High-definition Power Line Communication) communication interface.

4.1 COM HUB SYNC PLC MODULE



1. 3x Ethernet
    a. ETH1 public network used for customer pc
    b. ETH2 internal network used for additional equipment
    c. ETH3 internal network used for additional equipment
2. USB 3.0 port [1]
3. Micro SD Card [1]
4. Reset button COM HUB Sync PLC
5. Wi-Fi button on COM HUB Sync PLC [1]
6. Status LED
    a. Power
    b. Status
    c. Error LED on COM HUB Sync PLC [1]
    d. WIFI LED on COM HUB Sync PLC [1]
    e. HD-PLC Status

[1] Will be added in a later COM HUB Sync PLC version

7. Power switch
8. Power connector
9. PLC sensor connections

4.2 ETHERNET

The COM HUB Sync PLC has three ethernet RJ45 connectors. The ETH1 port is capable of 1000-Mbit/s, ETH2 and ETH3 support 100-Mbit/s.

4.2.1 DEFAULT ETHERNET CONFIGURATION

COM HUB Sync PLC factory default ethernet settings for ETH[1]:

- IP address: 192.168.12.2
- subnetmask: 255.255.255.0

4.3 SENSOR PLC CONNECTOR

Power Line Communication establishes an Ethernet connection to the sensor over a three conductor power cable.

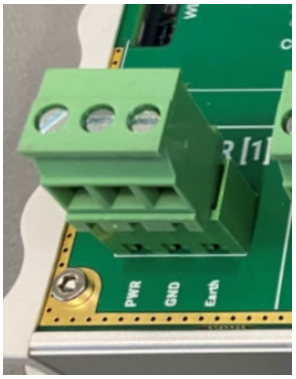


Figure 1 PLC connector

4.4 CONNECTION TO PLC J-BOX

The following table explain how the PLC sensor connector should be wired with PLC J-Box

COM HUB Sync PLC connector	PLC J-BOX connector
PWR	PWR
Ground	Ground
Earth	Earth

Table 1: Pin connection between COM HUB Sync PLC and PLC J-Box

5 POWER SUPPLY

The COM HUB Sync PLC will be delivered with a 48V power supply. It is possible to use a 3rd party power supply and connect it to the power connector. Make sure that the 3rd party power supply has enough power capacity to supply the COM HUB Sync PLC and the desired number of used sensors.

Sensor Type	Power consumption [W]
UMRR-11 Type 44 [1]	4.5 … 5.5
UMRR-11 Type 45 [1]	4.5 … 5.5
UMRR-11 Type 132 [1]	4.5 … 6
TRUGRD	9.5
TRUGRD Stream	11
SDLC Module	1.2
COM HUB Sync PLC	16

6 CABLE RECOMMENDATIONS

The cable requirements for the installation of the sensor are:

- For the utilization with a smartmicro PLC- J-Box:
  - Cable outlet 6.5mm to 9.5mm or 0.23in to 0.35in
  - For all installations, the minimum voltage indicated in the datasheet needs to be granted for the operating unit
  - For NEMA cabinet installations, a voltage drop by less than 14V is required

Please note that smartmicro can give no warranty on cable types other than those verified by smartmicro throughout testing and recommended as such. It is the customer's own responsibility to test and verify other cables for their particular purpose and installation variants, especially regarding communication capabilities.

The following field cables have been verified throughout testing by smartmicro, please contact us for further information.

- Advanced Digital Cable PVC/Nylon 600V 18AWG, Part Number 6803D

7 COM HUB SYNC PLC SENSOR SUPPORT

7.1 V7.1.0.2

Supported Sensors

- TRUGRD, TRUGRD Stream with sensor firmware v6.6.0.0

7.2 V7.2.0.0

Supported Sensors

- TRUGRD, TRUGRD Stream with sensor firmware v6.7.0.0

8 ADDITIONAL/OPTIONAL PRODUCTS

8.1 SDLC MODULE

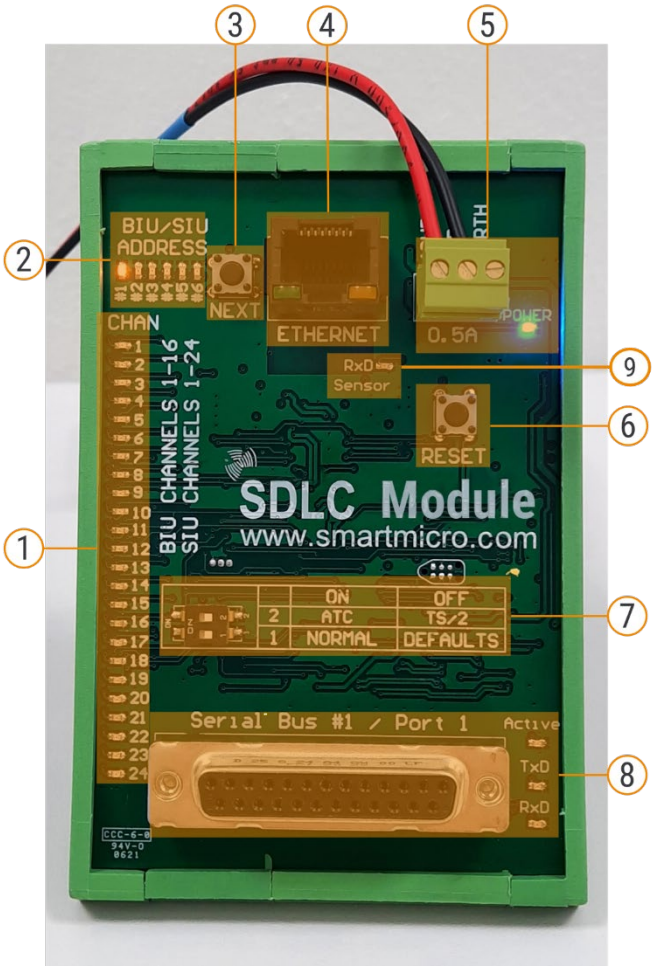


Figure 2 – SDLC Module

1. LED BIU/SIU output

2. LED BIU/SIU active
3. next button (press NEXT to display the next BIU)
4. RJ45 connection
    a. green Ethernet LED (is the Link LED showing it is connected to Ethernet)
    b. yellow Ethernet LED (is the data LED showing it is communicating over Ethernet)
5. power 10 - 48V (DC) with power LED
6. Reset button – To restart the module, hold reset button for 2 seconds until all LEDs light up
7. TS/2-ATC DIP switch (after changing DIP switch reset or power cycle for change)
    a. Note: The DIP switches are per Default set to Off. The second DIP-Switch has to be set to On (Normal), so that the setting can be stored permanently.
8. Serial Bus Port (TS/2, ATC, please find more information about the SDLC module in document [1])
9. The TxD and RxD LEDs indicate SDLC frames received (RxD) on the SDLC bus and sent (TxD)

8.2 PLC J-BOX

The PLC J-Box is used in combination with COM HUB Sync PLC. It converts the 4-wire standard Ethernet communication to a high-definition powerline (PLC) communication. For more information, please read the datasheet of the PLC J-Box[3].

9 COM HUB SYNC PLC INSTALLATION

The following pictures show how the COM HUB Sync PLC should be connected in the Field.

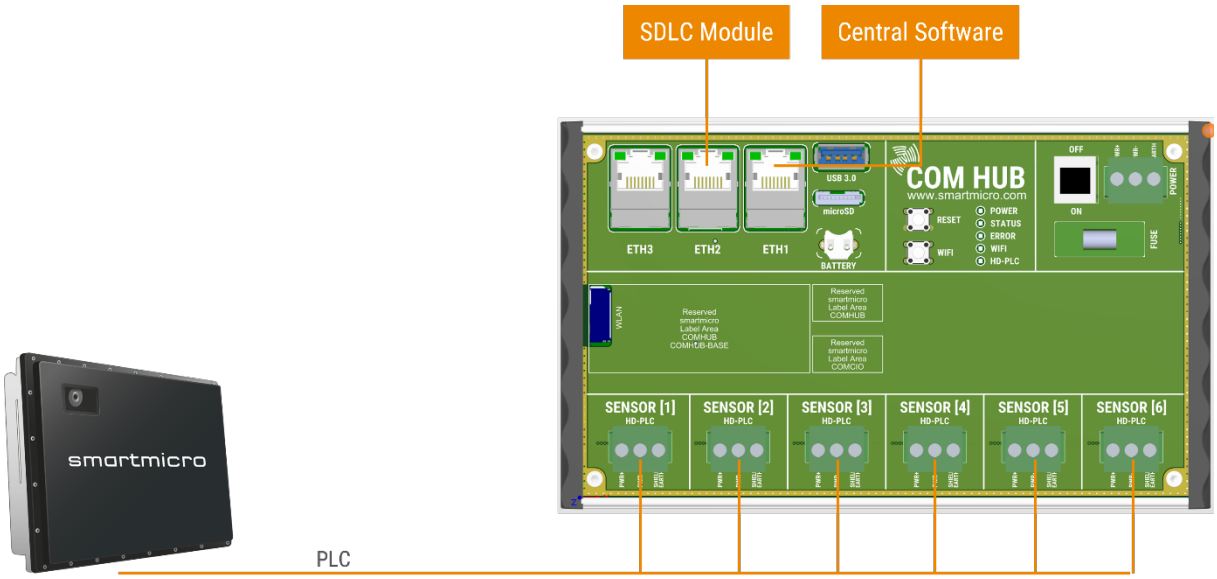


Figure 3 - COM HUB Sync PLC Example connection scheme

9.1 ASSEMBLY

The COM HUB Sync PLC is installed in the cabinet by insertion of the DIN Rail TS 35 mount. Additional accessories like the SDLC Module can also be mounted on the rail.

9.2 COM HUB SYNC PLC + SDLC MODULE

Connect the SDLC Module with the power source. Connect the SDLC Module with an ethernet cable to the ETH [2] Interface. Connect your PC to ETH [1]

9.3 START-UP COM HUB SYNC PLC

Connect the COM HUB Sync PLC to the power source and use the power switch to turn it on. The power LED is turning on.

10 COM HUB SYNC PLC CONFIGURATION

10.1 PREPARE PC

Pre-Requirement to configure the COM HUB Sync PLC is to change the IP address on the customer PC to 192.168.12.1.

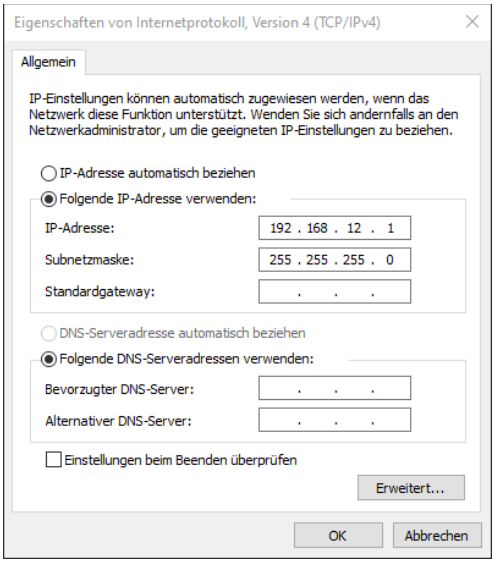


Figure 4 change customer PC IP address

11 TRAFFIC WEB UI

A detailed documentation for the WEB UI can be found here [4].

12 MQTT DATA STEAMS

COM HUB Sync PLC supporting MQTT network protocol. Connecting to the MQTT Brocker use a MQTT Client and connect to the 192.168.12.2.

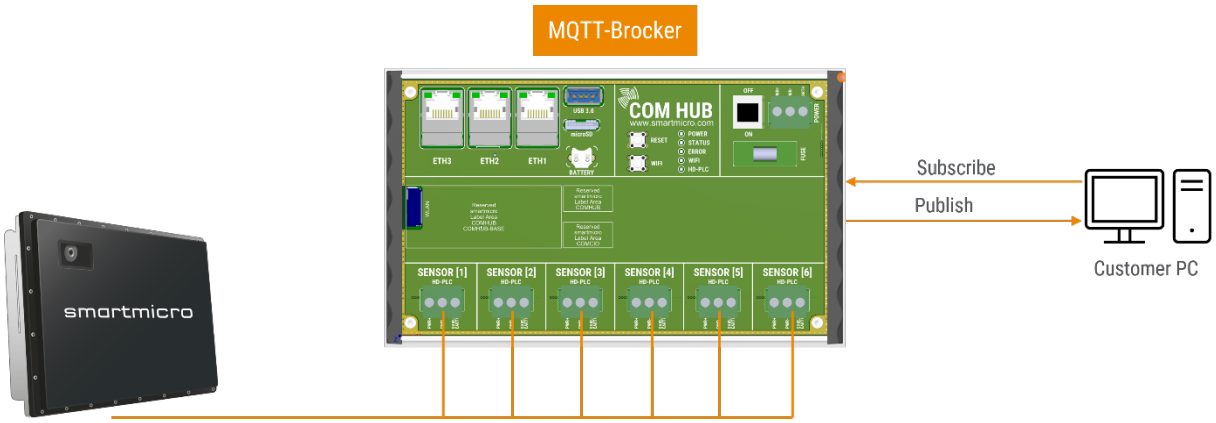


Figure 5 COM HUB MQTT-Brocker

12.1 TOPICS

12.1.1 TRAFFIC-TRIGGERS-OUTPUT

Property	Type	Description
timestamp	ISO-8601 timestamp	Time when trigger information has been aggregated on the ComHub

Table 2 timestamp

The array traffic_triggers contain all trigger outputs and additional properties that are associated to this trigger output.

Property	Type	Description
reference_name	string	Reference name of the trigger that is active
associated_lane	string	Reference name of the lane associated with this traffic trigger

associated_zone	string	Reference name of the zone associated with this traffic trigger
associated_sensor	string	Reference name of the sensor associated with the associated zone

Table 3 Trigger output

12.1.2 SENSOR-TRAFFIC-OBJECTS

Property	Type	Description
reference_name	string	Reference name of the sensor providing the list of objects
timestamp	ISO-8601 timestamp	Middle of the acquisition time when objects were detected
cycle_time	float	Duration of the last radar cycle time in [s]

Table 4 Object list header

Each element of the object array contains the following properties.

Property	Type	Description
id	integer	Unique sensor traffic object identifier
class	object *class* (see table below)	Detected object class
tracking_status	tracking status	Detailed Tracking Information
position_front	coordinate	Coordinates of the estimated object front position
position_facing	coordinate	Coordinates of the object position facing the sensor
heading	float	Direction the object is heading as yaw or azimuth angle in [°]
length	float	Length of the object from front to back in heading direction in [m]
speed	float	Absolute speed in heading direction of the object in [m/s]
acceleration	float	Absolute acceleration in heading direction of the object in [m/s^2]

within_zone	array of strings	List of zones the object is detected within or empty
closest_lane	string	The lane that is closest to the object or empty

Table 5 object list

If a sensor can provide the object position as GPS coordinates, the following optional properties are also available.

Property	Type	Description
gps_position_front	GPS coordinate	GPS coordinates of the estimated object front position
gps_position_facing	GPS coordinate	GPS coordinates of the object position facing the sensor

Table 6 GPS postions

Object Class
undefined
pedestrian
bicycle
motorbike
car
transporter
short_truck
long_truck

Table 7 object class

Property	Type	Description
new_object	boolean	Indicates that this object appears for the first time
cycles_since_last_update	integer	Number of cycles since last tracking update of the object

quality	float	Tracking quality indicator in the range from 0 = bad to 1 = good
mileage	float	Distance the object is tracked in [m]

Table 8 tracking status

Coordinate
[<x-coordinate>, <y-coordinate>, <z-coordinate>]

Table 9 x,y and z coordinate

GPS Coordinate
[<latitude>, <longitude>]

Table 10 GPS coordinate

12.1.3 SENSOR-ALIGNMENT

Property	Type	Description
reference_name	string	Reference name of the sensor providing the list of objects
timestamp	ISO-8601 timestamp	Time when alignment information have been received from sensor
elevation	float	Measured elevation angle reported by the sensor in [°]
roll	float	Measured roll angle reported by the sensor in [°]

Table 11 Sensor alignment

12.1.4 SENSOR-DIAGNOSTIC

Devices sending only supported diagnostic properties.

Property	Type	Description
reference_name	string	Reference name of the sensor providing the list of objects
timestamp	ISO-8601 timestamp	Time when diagnostic data have been received from sensor

temperature_dsp	integer	Any temperature value from the radar dsp reported by the sensor in [K]
sensor_blind	boolean	Flag indicating that a sensor blind situation is detected
rain	boolean	Flag indicating that rain is detected
interference	boolean	Flag indicating that interference is detected
supply_voltage	float	Measured supply voltage reported by the sensor in [V]
rain_intensity	integer	Indicator for rain intensity in percent
disturbed_ramps	integer	Percentage of disturbed ramps when interference is detected
disturbed_samples	integer	Percentage of disturbed samples when interference is detected
roll_misalignment	boolean	Flag indicating that roll misalignment is detected
roll_misalignment_angle	float	Angle of roll misalignment in [°]
yaw_misalignment	boolean	Flag indicating that yaw misalignment is detected
yaw_misalignment_angle	float	Angle of yaw misalignment in [°]
elevation_misalignment	boolean	Flag indicating that elevation misalignment is detected
elevation_misalignment_angle	float	Angle of elevation misalignment in [°]
temperature_frontend	integer	Any temperature value from the radar frontend reported by the sensor in [K]

Table 12 diagnostic list

12.1.5 TRAFFIC -STATISTIC-OUTPUT

Property	Type	Description
reference_name	string	Reference name of the sensor providing the list of objects

timestamp	ISO-8601 timestamp	Time when diagnostic data have been received from sensor
reference_name	string	Unique identifier name of the traffic zone
statistic_functions	Statistic function (see table below)	List of the Statistic Functions is active
object_class	object *class* (see table above)	List of object classes considered for the statistic functions
statistic_result	integer	result for the statistic function

Table 13 Traffic statistics

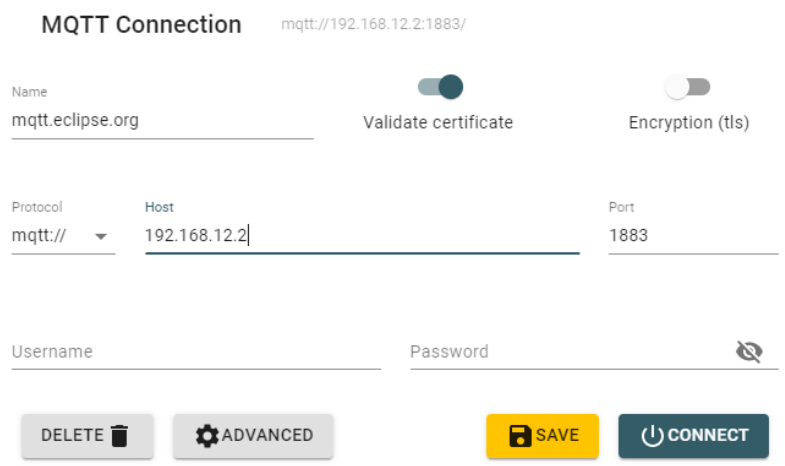
Statistic Functions
volume
occupancy
average_speed
percentile_speed
headway
gap

Table 14 Statistic function

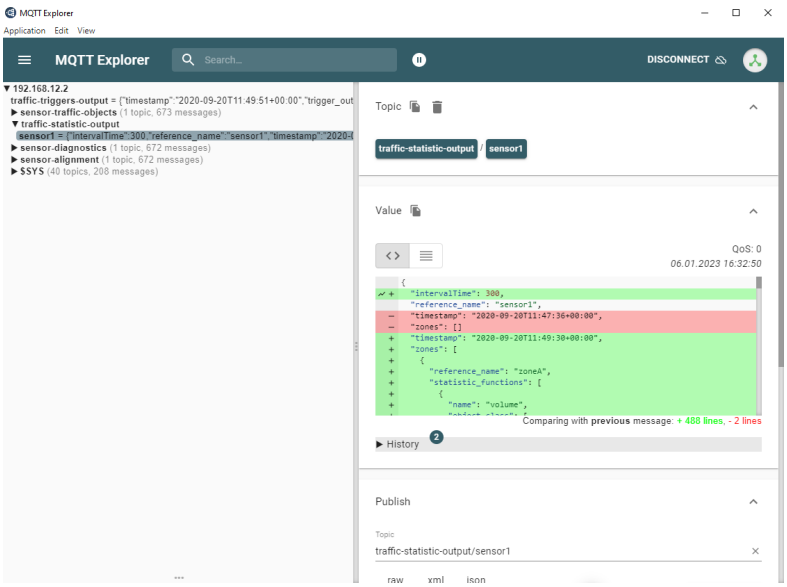
12.2 DISPLAY MQTT DATA STREAMS

In order to visualize the MQTT streams, the MQTT explorer can be used. The MQTT explorer is a free software, which can be downloaded from the internet.

Once the explorer is opened, the following pop up window will appear. Please enter the IP address of the COM HUB Sync PLC and the MQTT port is always 1883.



then click in the connect button. The received MQTT streams will be displayed



13 FIRMWARE UPDATE

13.1 FTP WITH FIRMWARE V7.1.0.2

Use a command prompt and open e new ftp connection to the COM HUB Sync PLC with:

- ftp 192.168.12.2

user: anonymous

pass: anonymous

- cd install

Load the new firmware file to the COM HUB Sync PLC with:

- ftp> put FILE_IMAGE_NAME.img.enc

Now close the connection with:

- ftp> close
- power cycle the COM HUB Sync PLC
- Update takes about 4 minutes, please don't switch off the power!
- If the firmware update was successful, the firmware will be deleted on the ftp folder. If the update is not successful, the COM HUB Sync PLC will append 'FAILED' to the firmware file name

13.2 WEB UI WITH FIRMWARE 7.2.0.0 AND GREATER

Connect to the COM HUB Sync PLC and access the Web UI on http://192.168.12.2/. Click on Update Firmware button on the Dashboard under Devices Information.

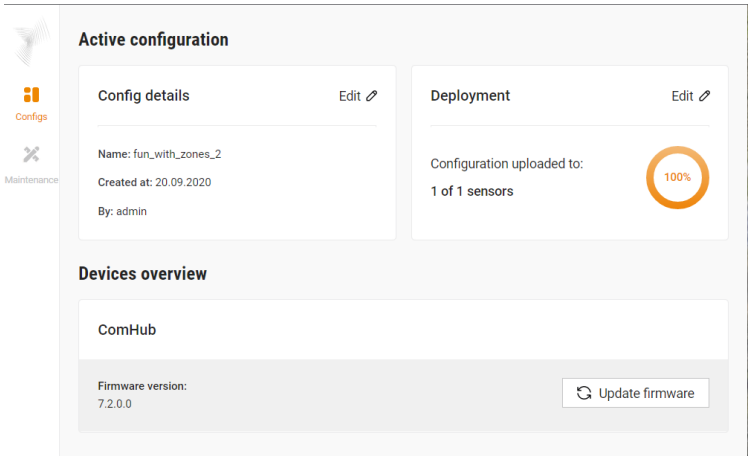


Figure 6 – COM HUB Sync PLC Web UI Dashboard

Select the COM HUB Sync PLC Firmware file. The File will be uploaded to the COM HUB Sync PLC. Press Reboot and the COM HUB Sync PLC starts with update process. Update takes about 4 minutes, please don't switch off the power!

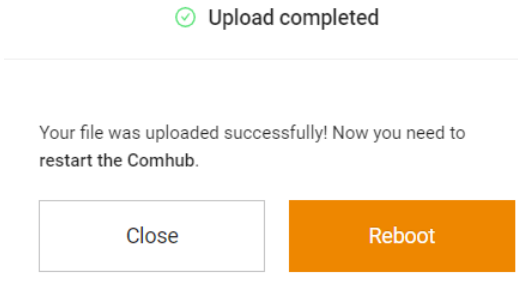


Figure 7 – COM HUB Web UI Firmware Upload

14 COM HUB SYNC PLC RESET

COM HUB Sync PLC is offering two reset functionalities.

14.1 IP SETTINGS RESET

The ethernet settings will be reset to the default COM HUB Sync PLC factory default ethernet settings for ETH[1]:

- IP address: 192.168.12.2
- Subnet mask: 255.255.255.0

1. COM HUB Sync PLC is on
2. Press reset button for 3 seconds, release the reset button
3. status led is solid while reset is in progress
4. when status led is start blinking the COM HUB Sync PLC can be reached with the default ip settings

14.2 FACTORY DEFAULT RESET

Factory default reset includes the ip settings reset. In addition to that, all saved data will be erased.

1. Power cycle COM HUB Sync PLC
2. During boot up press reset button for 20 seconds until the status led is solid
3. status led is start blinking and indicates that, the COM HUB Sync PLC is finished with the factory default reset

15 FREQUENCY APPROVALS

16 LEGAL DISCLAIMER NOTICE

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