
INTEGRAL UNIVERSAL SUBSTATION PROCESSOR

MANUAL



·:BITHOUSE:·
every bit matters

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About the Document

Document Scope

This document describes the **Integral Universal Substation Processor** and its modules, including installation and maintenance information

Safety information

Intended use

The product is intended for building automation and light industrial applications.

Only appropriately trained people are authorized to work on and with this product. They must be familiar with applicable standards and regulations.

The product must be used in accordance with all applicable safety requirements, regulations and instructions provided in the product documentation, including this manual.

Only recommended conductors/cables and accessories/equipment may be used with the product.

Environmental Specifications

PARAMETER	VALUE	NOTE
Operating temperature	0–50°C	
Humidity	<95 % (non-condensing)	

Disposal / Recycling

WEEE business products reception points:

<https://www.elker.fi/en/reception-points-for-business-products/>

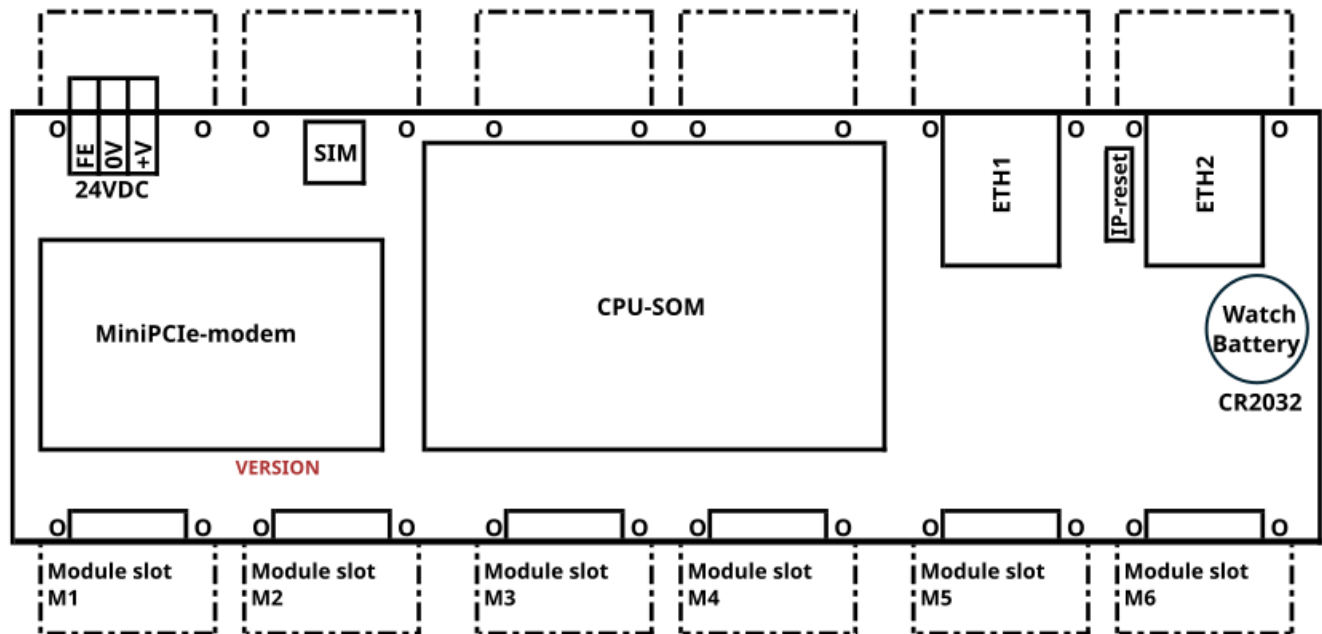
About the product

Product Overview

Integral Universal Substation Processor is a modular logic controller and communication gateway. The base unit includes the main processor, an integrated slot for a 4G modem, and two Ethernet ports. In addition, the modular section provides six slots for **Integral Modules**, allowing flexible configuration for different types of communication.

- Six module slots
- 4G modem ready
- Two 10/100 Mbps Ethernet RJ45 ports
- Web interface Actiweb9

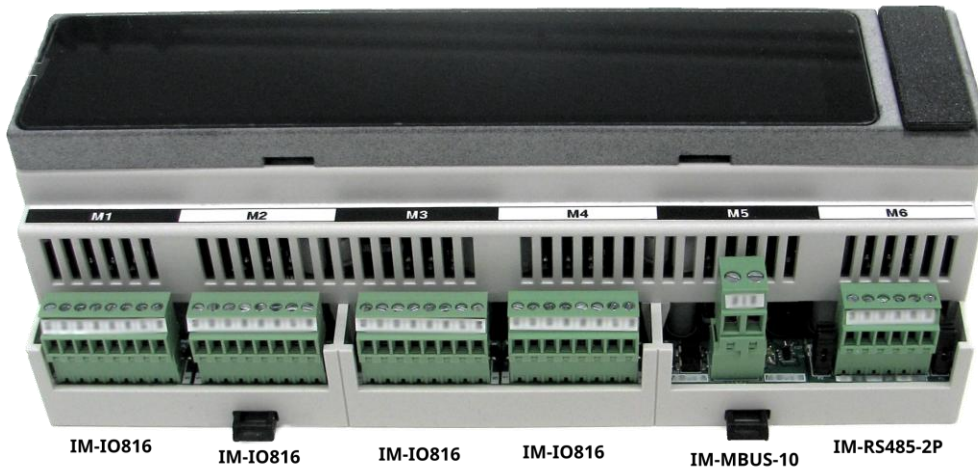
Connectors and components



SYMBOL	PART	DESCRIPTION
FE	Connector	Functional Earth
0V	Connector	0 V _{DC}
+V	Connector	24 V _{DC} power supply
ETH1	Connector	Ethernet ports (identical)
ETH2		
CPU-SOM	Processor	Various options
MiniPCIe	Modem	Optional
SIM	SIM-card	
IP-reset	Button	IP-address reset
Watch Battery	Battery	CR2032
Module slots M1-M6	Integral Module	As ordered

IM-Modules

- Modules are factory-installed as ordered.
- Width of each module: 2 DIN modules (33,1 mm)
- Tightening torque: 0,2 Nm



Example configuration: M1–M4 with I/O modules, M5 with Meter-Bus module, M6 with RS485 module.

IM-IO816	IM-RS485-2P	IM-MBUS-10 (-250)	IM-USB-C-4P
I/O	Modbus (RS485)	Meter-Bus	USB-C (USB 2.0)
8 analog, 16 digital	2 buses	10 or 250 devices	4 USB-C connentions
CABLE			
Analog. Over 10 m: twisted pair cabling	Twisted pair cabling	Bus is not sensitive to cable type or twisted pair	
≤ 1,5 mm ² / 0,2 Nm	≤ 1,5 mm ² / 0,2 Nm	≤ 2,5 mm ² / 0,6 Nm	

Procedures

IM-IO816 wiring examples

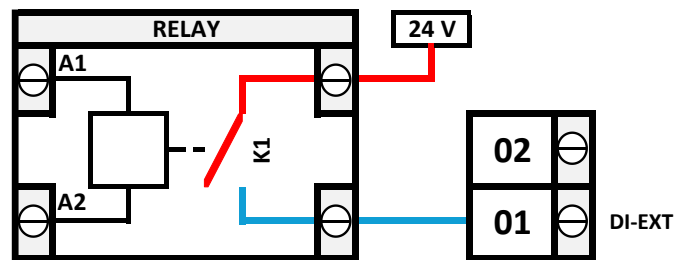
- Each IM-IO816 module provides 16 universal I/O channels.
- Digital input: 1 channel. Analog input: 2 consecutive channels.

DI

The digital input can operate with either a voltage-based or resistance-based connection. Function is identical for even and odd channels.

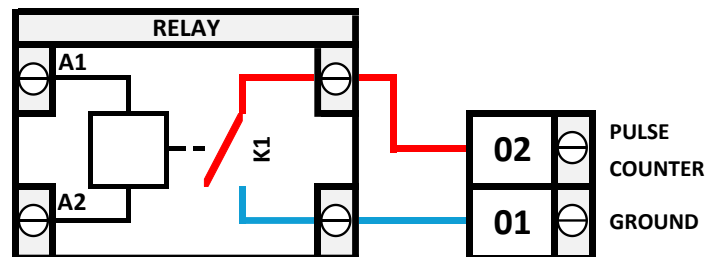
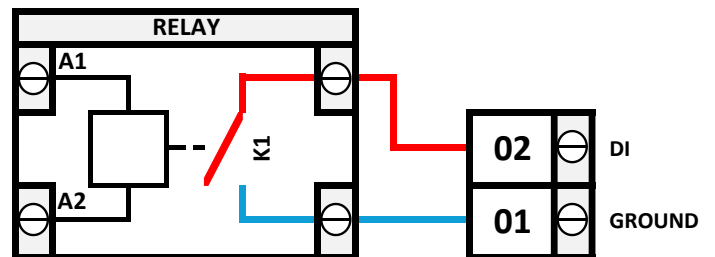
DI-EXT (Voltage Input)

- The DI-EXT input is connected to an external voltage source.
- Logic levels:
 - 0 = voltage < 3 V
 - 1 = voltage > 7 V
 - 3–7 V retains previous state.
- Each channel includes a 100 kΩ pulldown resistor to ground. An unconnected input is interpreted as logical 0.



DI (Resistance Input)

- The DI input connects to ground (0 V_{bc}) through a potential-free relay output or open-collector output.
- Example: Channel 01 serves as ground reference; alternatively, a terminal block can be used.
- Logic levels:
 - 0 = resistance > XXX Ω
 - 1 = resistance < XYZ Ω
 - Intermediate values retain previous state.



DI Pulse Counter

- Operates as the DI (resistance input).
- The counter increases whenever the channel switches to ground.

DO

Digital outputs operate in open-drain mode (equivalent to open collector).

- 0 / Off: High impedance (floating)
- 1 / On: Channel connected to ground (0 VDC)

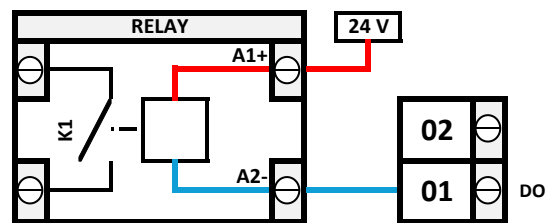
Function is identical for even and odd channels.

Notes:

1. Each channel has a 100 kΩ resistor to ground; an LED may glow even when off.
2. Inductive load protection (24 V TVS diode to ground) protects against voltage spikes.
3. Cannot switch AC power directly—use an intermediate relay.
4. Output transistor is current-limited (>1 A cutoff).

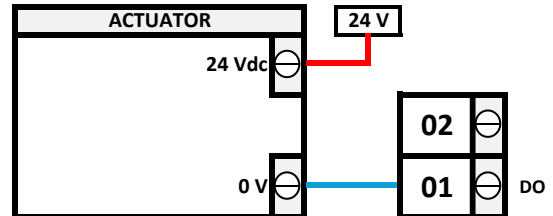
DO Two-Point (Potential-Free)

- Provides isolated control via auxiliary relay.
- Terminal (01) is ground switched through the relay contacts.



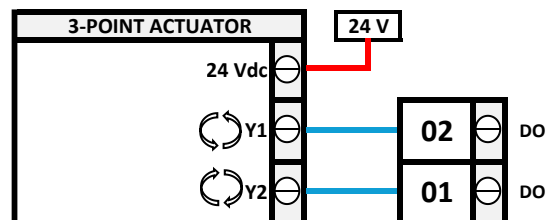
DO Two-Point (Non-Isolated)

- Terminal (01) is ground switched directly without isolation.



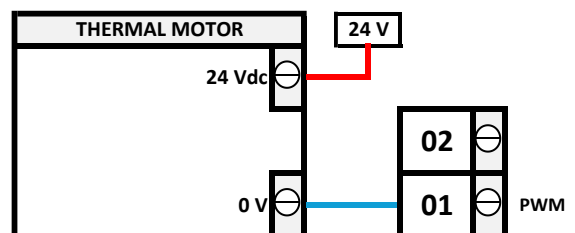
DO Three-Point

- Terminals (01) and (02) are ground connections used to control actuator open/close directions.
- If actuator requires two 24 V_{DC} control inputs and one common ground, use an intermediate relay.



PWM Output

- Terminal (01) acts as ground that is rapidly switched to regulate devices such as thermal actuators.
- PWM output operates electrically like a DO output.

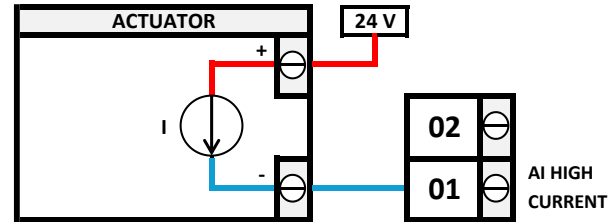


AI

Analog input: measurements use two consecutive channels (e.g. 01–02, 03–04, ...).

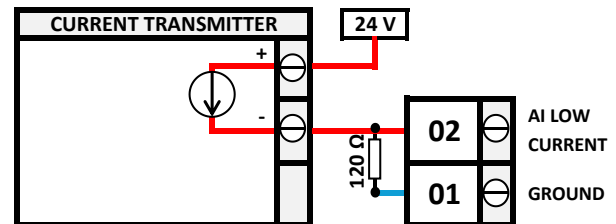
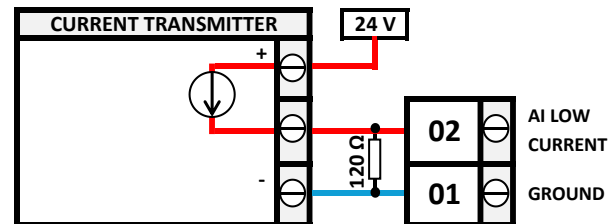
AI High-Current Mode

- Either terminal (odd or even) connected to ground — same as constantly active DO.
- Measurement range: 0–1 A.
- For rough monitoring, not precision measurement.



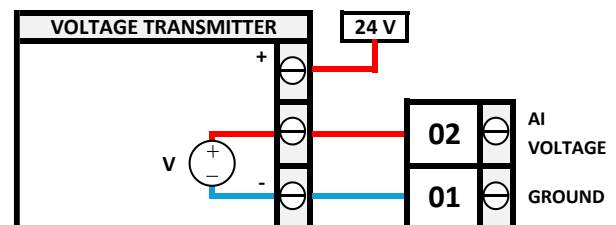
AI Low-Current Mode

- Odd terminal (01): Ground
- Even terminal (02): Measurement signal (0–20 mA)
- Requires external 120 Ω resistor between terminals 01 and 02.



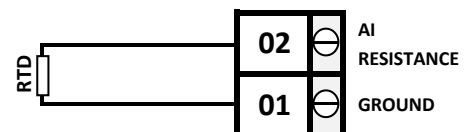
AI Voltage Mode

- Odd terminal (01): Ground
- Even terminal (02): Measurement signal (0–10 V).



AI Resistance Mode

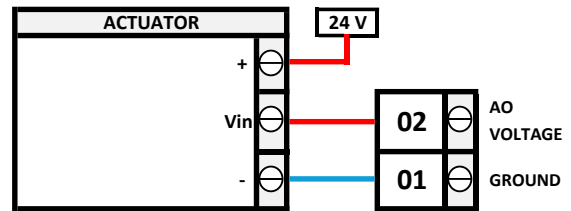
- Measures resistance between terminals 01 and 02 (0–1 M Ω).



AO

Analog outputs use two consecutive channels (e.g. 01–02, 03–04, ...).

- Even terminal (02): Control signal (0–10 V)
- Odd terminal (01): Ground.



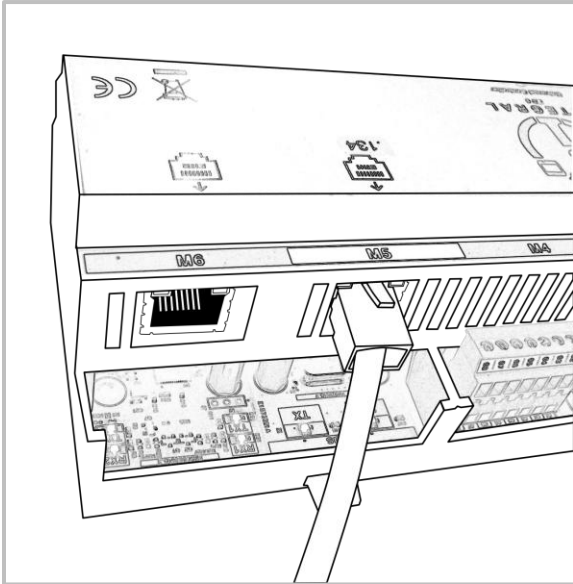
IP-address

- Default IP Address: 192.168.10.134 (Eth1)
 - Press and hold the IP-reset button under the top cover for ~5 seconds. Restores default IP settings (temporary; not saved to disk).
 - Models with display: IP-reset button is next to the display, under a dust cover.
 - Both Ethernet ports automatically obtain an address via DHCP when available.

DEFAULT IP SETTINGS	
IP-address	192.168.10.134
Subnet mask	255.255.255.0
Gateway	192.168.10.1
DNS	192.168.10.1

Accessing the Actiweb9 interface

The Actiweb9 software platform is accessed through a web-based user interface. The device is connected to the network via the ETH1 port.



Open a web browser and navigate to the address **192.168.10.134**. Log in using the username **admin** and the password provided to you as the customer. The start page of the user interface includes a sidebar from which all functions can be accessed. Select the Logout button to sign out of the interface.



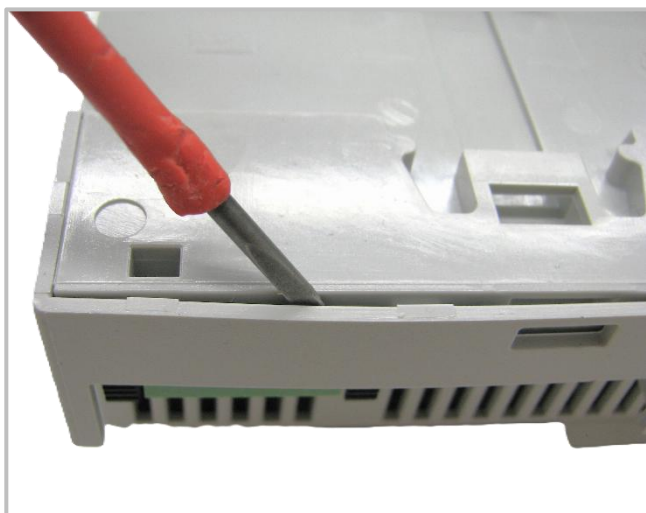
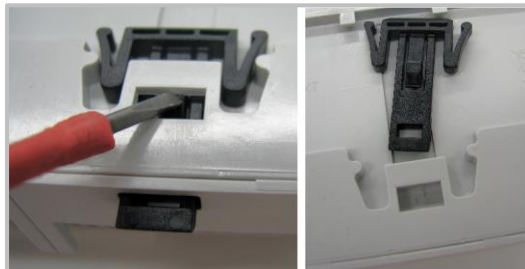
Additional instructions on using the interface: see Actiweb9 Manual (coming soon).

Maintenance

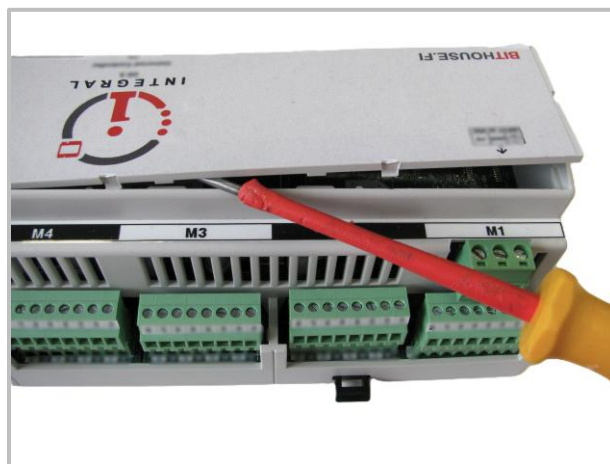
⚠ All maintenance procedures are to be done **power off, unless otherwise instructed.**

Opening the enclosure

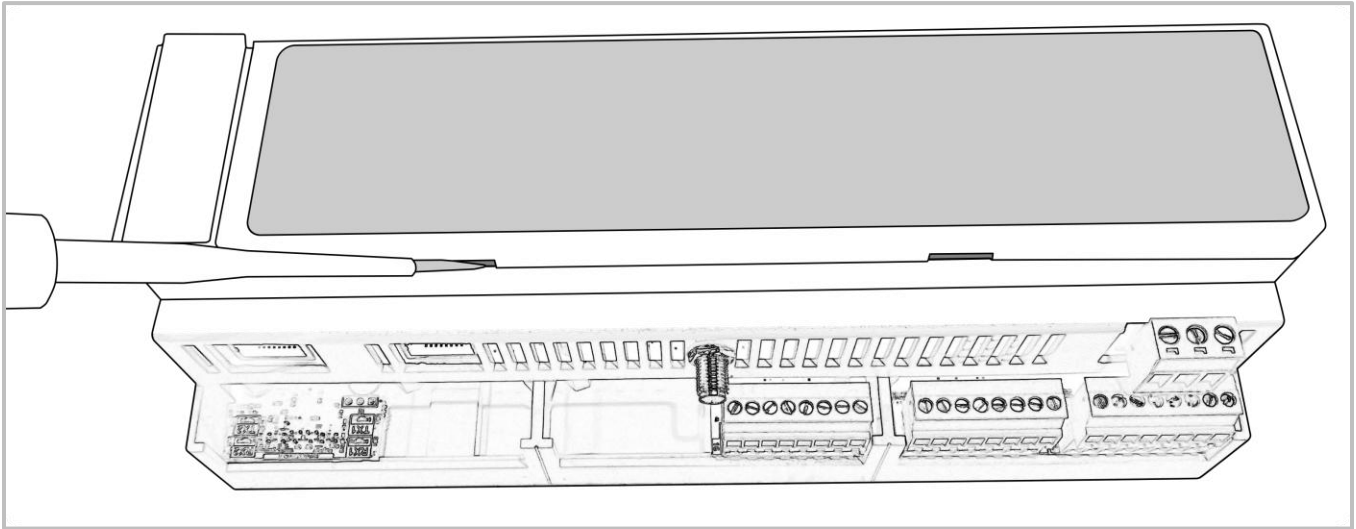
- Main housing: Detach the bottom clips first to remove the case more easily. Open from the bottom with a flat screwdriver.



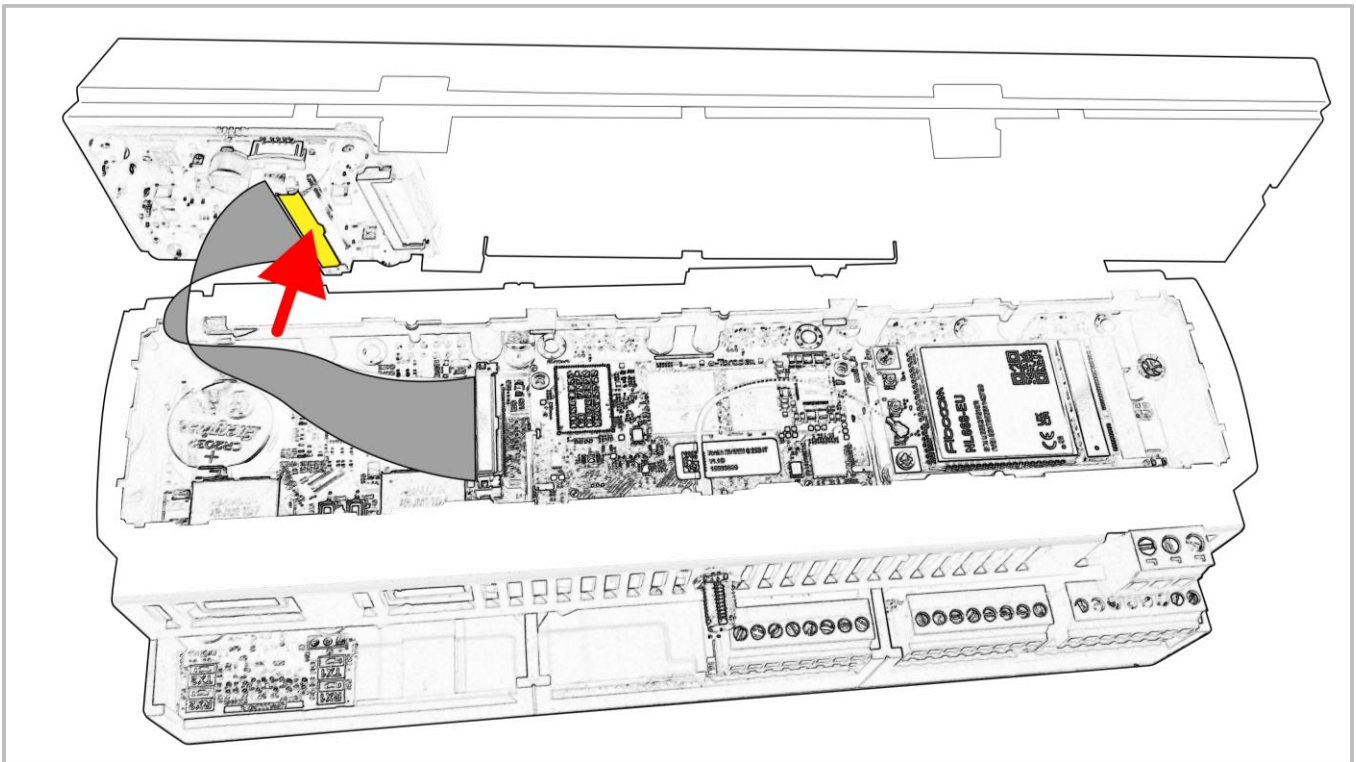
- Without display: Open the cover using a flat-head screwdriver via the notch on the edge.



- With display: detach the display frame from the casing using a flat-head screwdriver via the notch on the edge.



- Unplug the display cable by pressing the part of the connector marked yellow on the picture below (with the text PUSH). To plug it back in, push it evenly in to the connector, so that both edges of the connector click into place.



Installing or replacing a module

ESD precautions recommended

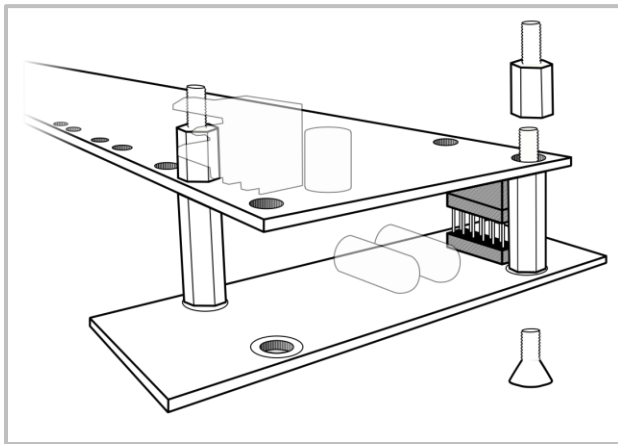
Current model (with module frame)

- The enclosure is opened by taking off the bottom of the enclosure.
- The terminal blocks of the connection points are disconnected from the module to make it easier to pull the module out of the enclosure.
- All of the modules are attached to a single module frame.
 - **Pull out** the old module and **press** the new one **in**.

The previous model (screws and standoffs)

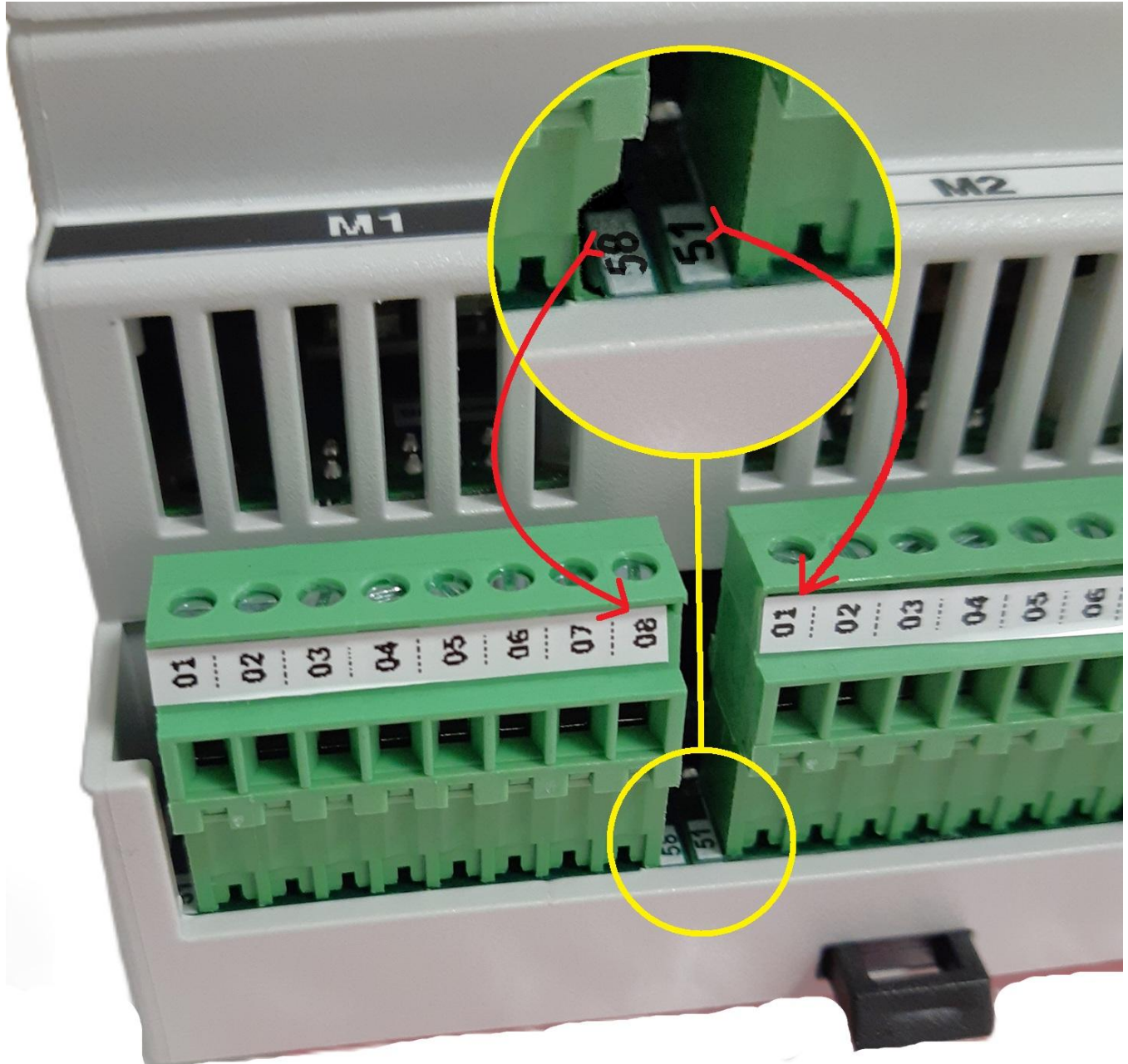
- The enclosure is opened: both the cover/display frame and the bottom plate.
- The terminal blocks of the connection points are disconnected from the module to make it easier to pull the module out of the enclosure.
- The screws at the bottom of the module are screwed open.
- The module is pulled out and replaced with another one.

Note: unscrewing the module might loosen the 19mm and 8mm standoffs; a tightness check is recommended before placing the new module.



- The module is attached with two screws diagonally through the base. Screws connect to 19 mm standoffs fitted on top of the module.
- The module connects to the CPU board via a pin connector.
- The 19 mm standoffs connect to 8 mm standoffs fitted on top of the CPU board

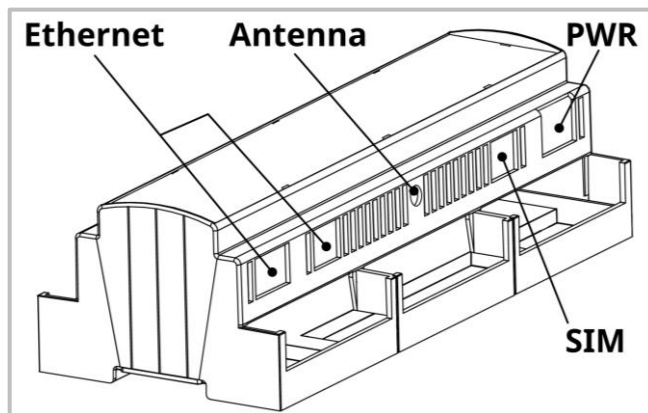
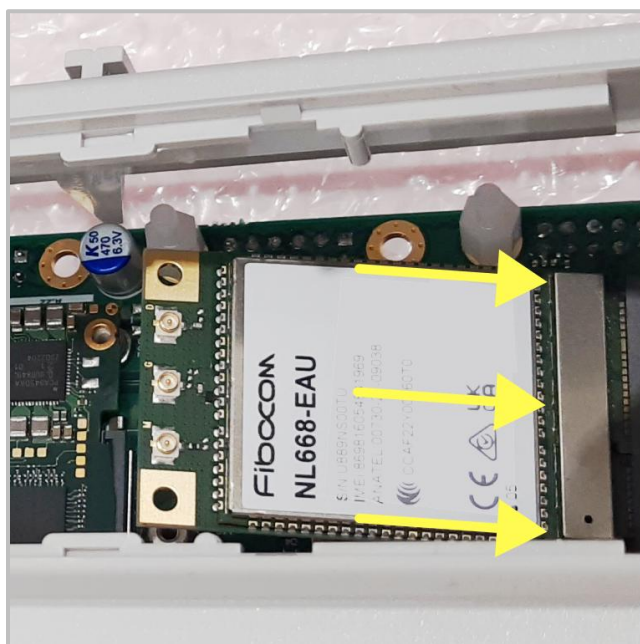
Note: when placing the terminal blocks back, make sure that they are in their correct places. For example, IM-IO816 module has two similar terminal blocks, which can only be distinguished by the connection point numbers. The numbers on the circuit board should follow the order of numbers on the terminal blocks.



Using the MiniPCIe Slot

The MiniPCIe slot can be used for optional expansion cards, such as a 4G/LTE modem or Bluetooth adapter.

PARAMETER	SPECIFICATION
Power supply	3.3 V (1.5 V supply not supported)
Bus interface	USB (no PCIe signals)
SIM card	Nano SIM
Antenna connection	The antenna can be installed to the enclosure opening using a short “pig tail” cable (typically ~8 cm, u.FL ↔ SMA)
Card mounting	two M2 screws



Related documents

Integral Universal Substation Processor data sheet

Contact information

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<https://www.bithouse.fi/en>