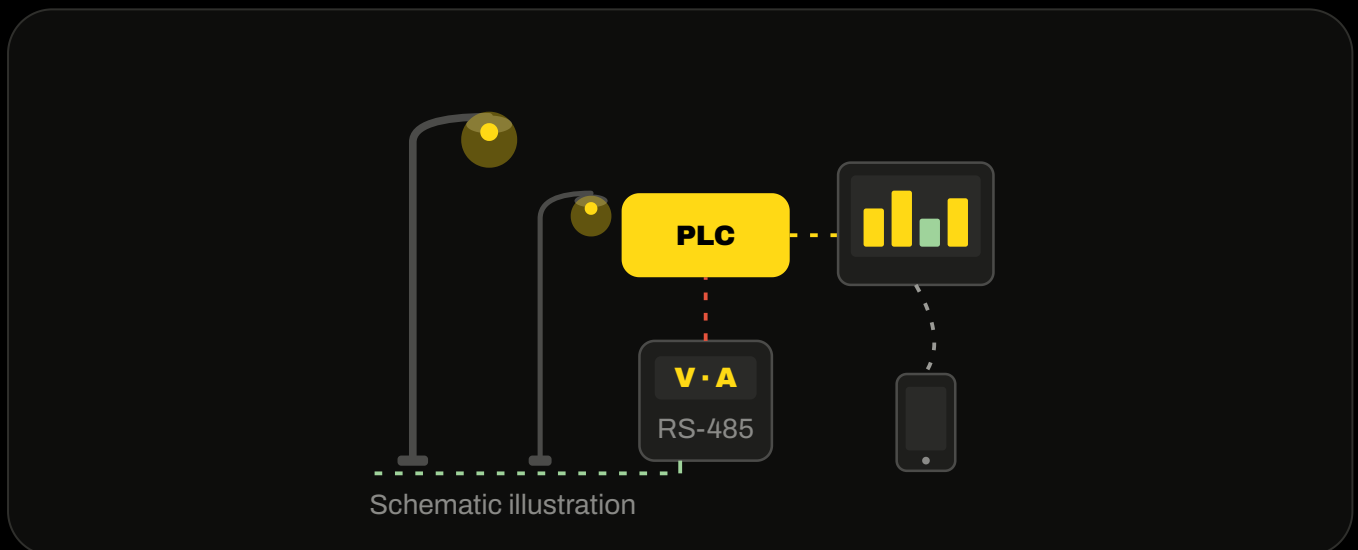


ELECTRICAL NETWORK · M-DUINO 19R+

Voltage and current, live. **An alarm past the limit.**

A current analyzer, an M-Duino PLC and a Panel PC watch a street lighting supply.

[Read the interactive case study online ›](#)

1

current analyzer on RS-485, read with Modbus RTU

8

relay outputs on the PLC to drive contactors

1

Panel PC with an MQTT broker and Node-RED

3.3V

lithium coin cell that keeps the clock on time

THE CHALLENGE

Real-time consumption, not a total at the end of the month.

Street lighting uses energy every night. Real-time knowledge of what it uses helps to know what the installation costs now. The system must read voltage and current, raise an alarm when the current passes a set limit, act on the circuits if needed, and show all of it live, also from far away.

01

Read the analyzer

A current analyzer measures the voltage and the current of the supply. Analyzers normally talk over RS-485, and Modbus RTU is a good protocol for it.

02

A limit on the current

When the current passes a set limit, the PLC raises an alarm. The limit is a value in the PLC program.

03

Act on the circuits

Contactors on the relay outputs of the PLC can cut the current flow when there is an alarm. This part is optional.

04

See it from anywhere

A dashboard on the Panel PC shows the data live. A VPN gives access from a PC or a smartphone.



When the analyzer gives contacts

Alarm contacts can go to the digital inputs of the PLC, and these alarms reach the server through its Ethernet port. RS-232 and SPI are other options to talk to an analyzer.

HOW IT WORKS

Three stages: read, decide, show.

Stage 1 · Read

The PLC asks. The analyzer answers.

The analyzer measures the voltage and the current of the supply. The PLC is the Modbus RTU master on the RS-485 line: it asks the analyzer for its values, one read after the other. Move the number of lamps, switch to day, then disconnect the cable.

- Voltage and current from the analyzer
- RS-485 line, Modbus RTU, the PLC is the master
- A typical way to do it: a comms alarm when the analyzer stops answering

Stage 2 · Decide

Over the limit: alarm, and the relay can act.

The PLC compares the current with the limit set in its program. Over the limit, it raises an alarm and sends it over Ethernet. If you use the option, a relay output opens a contactor and cuts the current flow. An alarm contact of the analyzer can also arrive on a digital input. Add a fault load, then try it with the contactor action off.

- Limit set in the PLC program
- Alarm sent through the Ethernet port
- Optional: contactors on the relay outputs

Stage 3 · Show

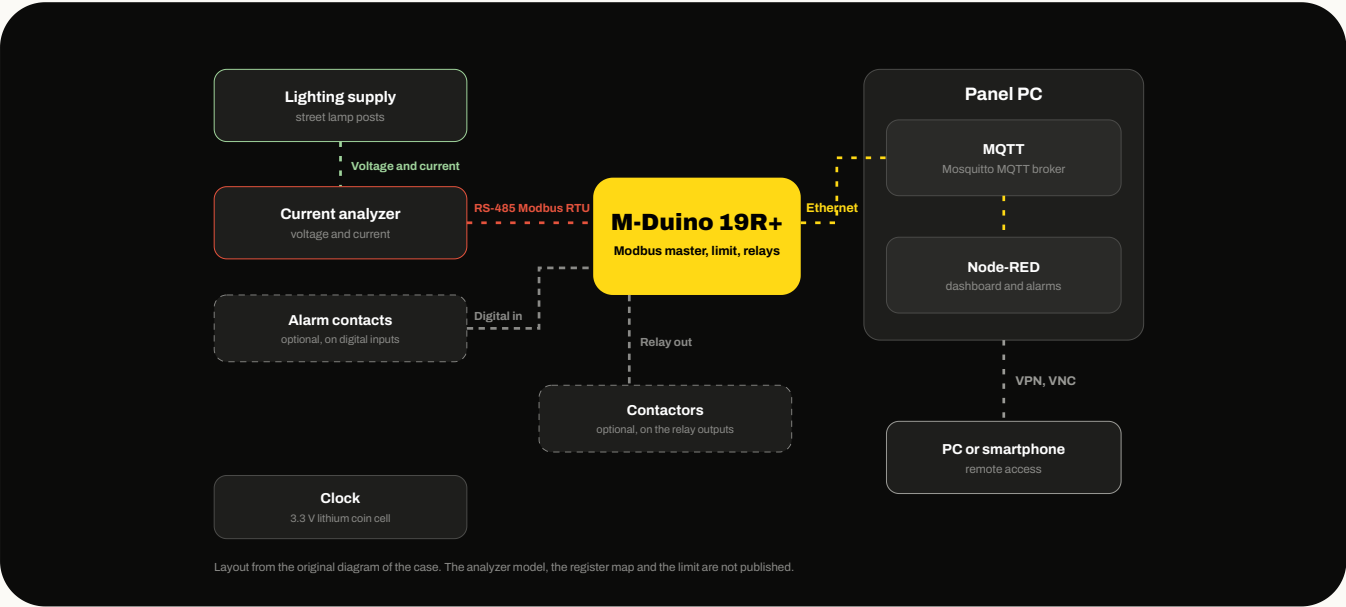
A dashboard on site. Access from anywhere.

The data goes to the Panel PC. It runs an MQTT broker (Mosquitto) and Node-RED. A typical way to do it: the PLC publishes each value on an MQTT topic, and the Node-RED dashboard shows it live and warns on an alarm. A VPN gives a PC or a smartphone access to the Panel PC, and VNC shows its screen. Open the remote view, then cut the internet link.

- MQTT broker and Node-RED on the Panel PC
- Live dashboard and alarm warnings
- Remote access over VPN, screen over VNC

How do you analyze an electrical network with a PLC?

The current analyzer measures the voltage and the current of the street lighting supply. The M-Duino PLC reads it over RS-485 with Modbus RTU, checks the limit, can drive contactors from its relay outputs and reads alarm contacts on its digital inputs. It sends the data over Ethernet to the Panel PC. There, an MQTT broker shares the data with Node-RED, which shows the dashboard and the alarms. A VPN gives access from a PC or a smartphone.



Measurement RS-485 (Modbus RTU) Ethernet VPN Optional

Signals and data

Signal	Between	Type	Purpose
Voltage	Supply → analyzer	Measurement	Voltage of the lighting supply
Current	Supply → analyzer	Measurement	Current of the lighting supply
Readings	Analyzer ↔ M-Duino	RS-485, Modbus RTU	Voltage and current data. The PLC is the master
Alarm contacts (option)	Analyzer → M-Duino	Digital in	Alarms that reach the server through the Ethernet port
Circuit action (option)	M-Duino → contactors	Relay out	Acts on the current flow when there is an alarm
Data and alarms	M-Duino → Panel PC	Ethernet	To the MQTT broker on the Panel PC
Dashboard	Broker ↔ Node-RED	MQTT	Live data and alarm warnings on the screen
Remote access	Panel PC ↔ PC or smartphone	VPN, VNC	Access to the data from any other point
Time	Internal clock	3.3 V coin cell	Keeps the time synchronised for the readings and the alarms

A PLC that reads and acts. A Panel PC that shows.



M-DUINO ETHERNET PLC ARDUINO 19R

The M-Duino 19R+ named in the case. An industrial PLC built around an original Arduino Mega 2560, with 8 relay outputs, Ethernet and RS-485. Here it reads the analyzer, checks the limit, drives the contactors and sends the data to the Panel PC. You program it with the Arduino IDE.

Role	Modbus RTU master, current limit, relay action, data to the Panel PC
Inputs	6: 4 analog/digital (0-10 Vdc), 2 digital optoisolated with interrupts (5-24 Vdc)
Outputs	11: 8 relays (230 Vac 4 A / 24 Vdc 2 A, resistive load), 3 analog/digital/PWM (0-10 V)
Comms	Ethernet, RS-485, RS-232, I2C, SPI, TTL serial
Built in	Real-time clock, µSD slot

Reference IS.MDuino.19R+, the current product. A contactor coil is an inductive load: the datasheet recommends an RC snubber, sized for the coil. The PLC has no galvanic isolation between the grounds of different systems: check the ground of the analyzer before you connect the RS-485 line.

[See the M-Duino 19R+ >](#)



TouchBerry Pi Panel PC 10.1" FLEX

The screen and the local server of the system. An industrial Panel PC with a Raspberry Pi 4, connected to the PLC over Ethernet. In this case it runs the MQTT broker and Node-RED, shows the dashboard and the alarms, and opens the VPN.

Role	MQTT broker, Node-RED dashboard and alarms, VPN access
Screen	10.1"
Computer	Raspberry Pi 4
Link to the PLC	Ethernet

The case used the TouchBerry Pi 10.1" with a Raspberry Pi 4B. The image and the link show its current version, the TouchBerry Pi Panel PC 10.1" FLEX. The family also has 7" and 18.5" models. To start the dashboard on its own at boot, see [kiosk mode for a Node-RED dashboard](#).

[See the TouchBerry Pi 10.1" >](#)

The PLC keeps the limit

The check against the limit and the relay action run in the PLC program. The dashboard shows the alarm. The PLC acts without it.

Remote access with a VPN

The VPN puts the PC or the smartphone in the same private network as the Panel PC. From there you open the dashboard, or the screen with VNC.

Room to grow

The PLC has 6 inputs and 8 relays. A typical way to grow: more analyzers on the same RS-485 line, each one with its own Modbus address.

SIMILAR NETWORK?

Tell us your network and your analyzer. An engineer will answer.

Tell us what you want to measure, which analyzer you have or plan to use, which limits matter and who must see the data. We will tell you which controller fits and how to connect it.

READ IT ONLINE

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