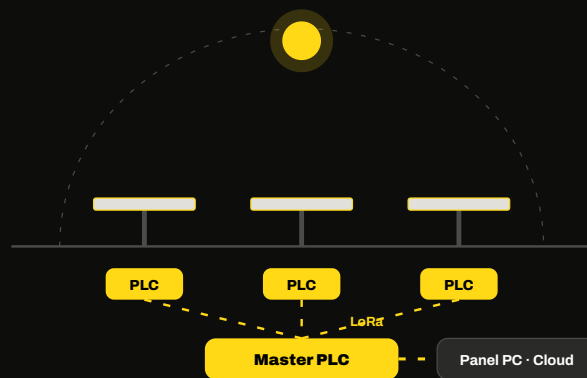


SOLAR TRACKING

Your panels follow the sun. **A PLC in every group** reports each move.

A reference design from Industrial Shields. Each solar panel moves on two axes to follow the sun. One PLC drives each group of panels, and a master PLC collects their data over LoRa. A Panel PC shows it, and the cloud stores it.

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


Schematic illustration

2 axes

per panel, one motor for each axis

1 PLC

per PV group, plus one master PLC

LoRa

radio link from the field PLCs to the master

Up to 30%

more energy than static panels, as the case cites

THE CHALLENGE

Follow a moving target, in every group, all day.

The sun moves all day. A fixed panel gets the most light only around noon. To get more energy, every panel has to change its position hour by hour. And you need to know where each panel is and what it produces, without a walk across the field. Sound familiar?

01

Two axes per panel

Each panel moves on an x axis and a y axis, with one motor for each axis. Every panel needs the right position at every hour.

02

A field, not a cabinet

Your panels stand in groups across the field. Each group has its own PLC. The case links the groups to the master PLC over LoRa radio.

03

Data you can use

Weather conditions, panel positions and energy, at any time. In the cloud, so you can improve the program and plan maintenance.



The energy is used or stored

A DC/AC inverter sends the energy to the AC distribution lines. The surplus energy goes through a DC/DC converter to a battery bank, for later use.

HOW IT WORKS

Two loops: the tracking, and the monitoring.

Loop 1 · Tracking

A sun table becomes two motor positions

Before the panels move, the sun positions for each hour of the day are calculated. The table goes into the PLC program, loaded with the Arduino IDE. During the day, the PLC of each group reads the hour and drives the x and y motors to the position for that hour. Move the slider. Compare a fixed panel with a tracked panel.

- Sun positions calculated in advance, hour by hour
- Program and table loaded with the Arduino IDE
- One PLC drives the x and y motors of its group

Loop 2 · Monitoring

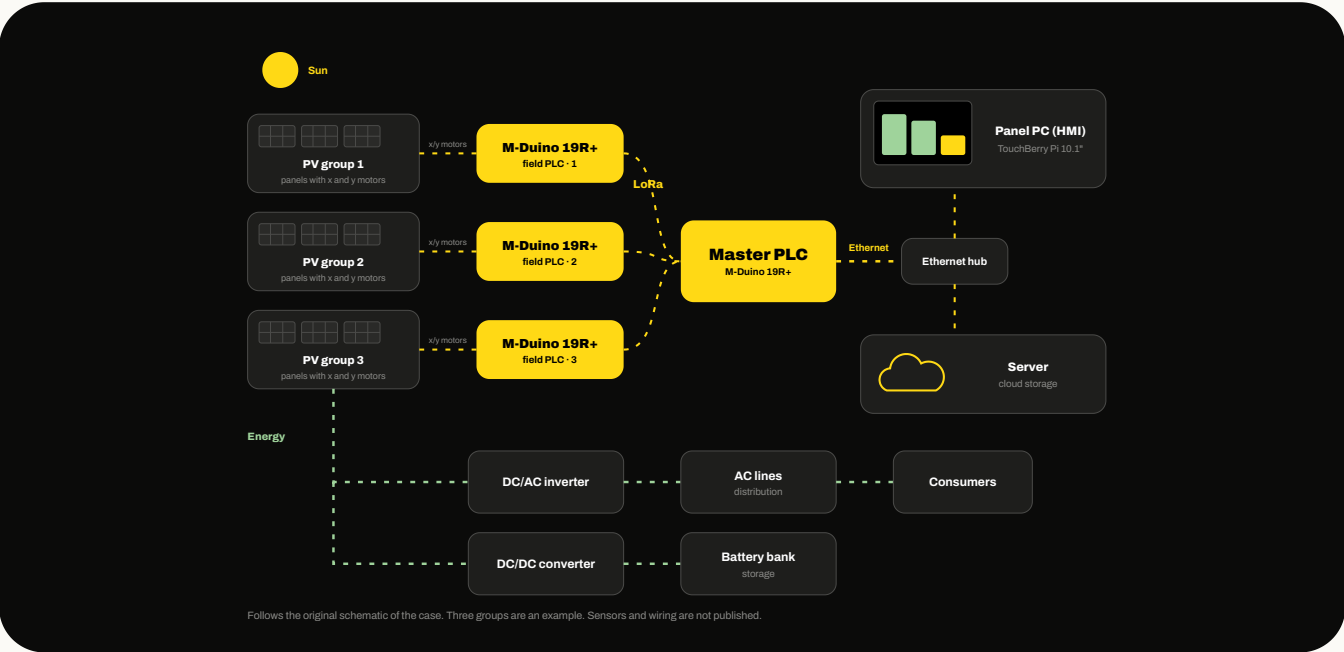
Every group reports. One screen shows the field.

Each field PLC sends its data to the master PLC over LoRa. The master sends it over Ethernet to the Panel PC, your HMI, and uploads it to the cloud. Over time, the data in the cloud helps you improve the PLC program. Press the buttons: a normal round, a passing cloud and a silent group.

- Field PLC to master PLC: LoRa
- Master PLC to Panel PC and cloud: Ethernet
- Weather, position and energy at any time

How does a PLC network control and monitor autonomous solar panels?

Field PLCs drive the x and y motors of each PV group and send their data over LoRa to a master PLC. The master sends it over Ethernet, through a hub, to the Panel PC and to the cloud server. On the power side, a DC/AC inverter feeds the AC distribution lines, and a DC/DC converter charges the battery bank. The diagram follows the original schematic of the case. It shows three groups as an example.



— Data: LoRa and Ethernet — Energy: DC and AC power — Example elements, not published by the case

Signals, data and energy

Flow	Between	Type	Purpose
Sun table	Engineering PC → PLCs	Arduino IDE	Loads the positions calculated in advance for each hour
Axis drive	Field PLC → x and y motors	AC motors	Moves each panel to the position for the hour. Wiring not published
Weather and position	Field → field PLC	Example	Weather conditions and panel position. Sensors not published
Field data	Field PLCs → master PLC	LoRa	Position, energy and other data of each PV group
Supervision	Master PLC → hub → Panel PC	Ethernet	HMI with the status of the whole field
Cloud storage	Master PLC → hub → server	Ethernet	Keeps the data to improve the PLC program over time
Energy to the lines	Panels → DC/AC inverter → AC lines	Power	Sends the energy to the places that need it
Surplus energy	Panels → DC/DC converter → batteries	Power	Stores the extra energy in the battery bank

PLCs in the field. A Panel PC for the whole view.



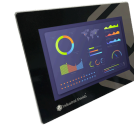
M-Duino Ethernet PLC Arduino 19R+

The case uses the M-Duino Ethernet PLC Arduino 19R+, the relay version of the Arduino Mega based M-Duino family. Its schematic shows the same type of controller in each PV group and as the master PLC.

Inputs	6 (4 analog 0-10 V)
Outputs	11 (8 relays, 3 analog/PWM)
Clock and storage	Real time clock (RTC), µSD card socket
Communications	Ethernet, RS-485, RS-232, TTL, I2C, SPI
Power	12 to 24 Vdc, IP20

In the case, the field PLCs and the master talk over LoRa. The case does not publish the radio module or the frequency band. Tell us your distances and your region (EU868, US902 or another band), and we will size the link with you.

[See the M-Duino 19R+ ›](#)



TouchBerry Pi Panel PC 10.1" FLEX

The case lists the TouchBerry Pi 10.1" with a Raspberry Pi 4B as the HMI. It shows the data that the master PLC sends over Ethernet. The FLEX is its current version.

Role	HMI for the whole field
CPU	Raspberry Pi 4B, 4 GB or 8 GB RAM
Screen	10.1" touch screen
Communication boards	Options: LoRa, 4G, CAN
Protection	IP20 standard, IP65 option

[See the TouchBerry Pi 10.1" ›](#)

Calculated, not guessed

The path of the sun is known. You calculate the positions once, load them with the Arduino IDE, and each PLC executes them. The M-Duino Ethernet PLC Arduino 19R+ has a real time clock on board.

One controller per group

Each PV group has its own PLC, and the master collects the data of every group.

Data that improves the program

The cloud keeps the history of weather, positions and energy. With it, you refine the program over the long term. For a ready example, see the [two-axis solar tracker project pack](#).

SIMILAR PROJECT?

Tell us about your field. An engineer will answer.

Tell us how many panels or trackers you have, how you group them, how far they are from your control room, and what you want to see on your HMI. We will tell you which controllers fit and how to connect them.

READ IT ONLINE

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