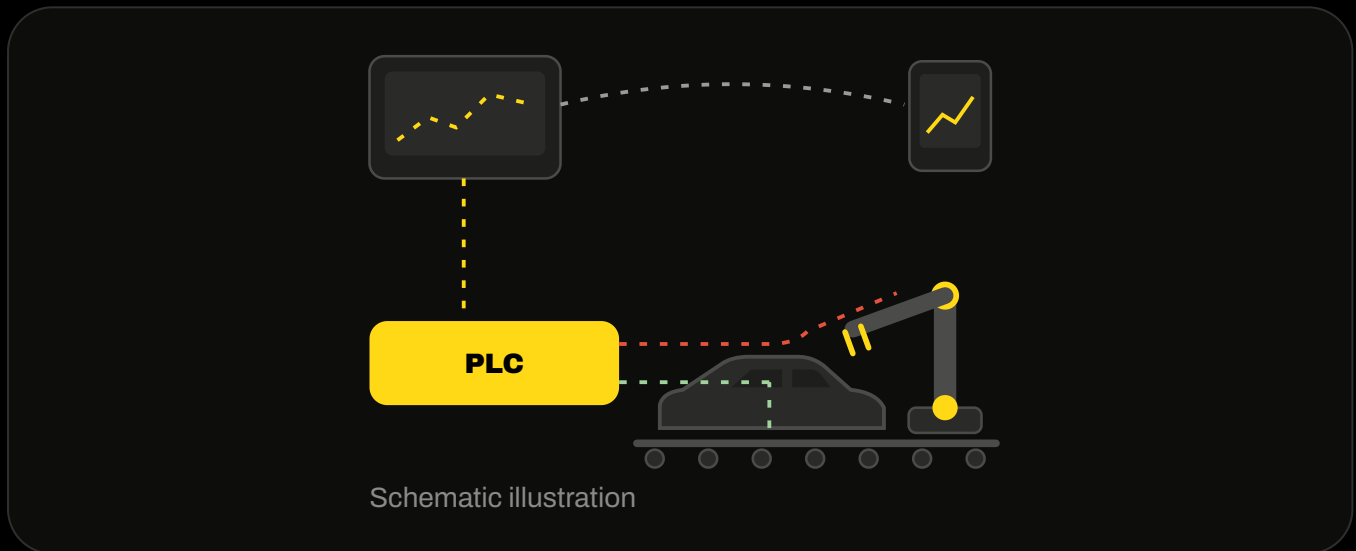


AUTOMOTIVE LINE · M-DUINO 38R

Measure the part. Command the robot.

An M-Duino PLC runs the line. A Panel PC shows it, also on a phone.

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


3

measurements in the process: weight, distance, assembly force

2

sources for the orders: stored in the PLC or sent from the Panel PC

16

relay outputs on the M-Duino 38R

24/7

control and monitoring, the goal of the case

THE CHALLENGE

An assembly line must measure, decide and give orders, all day.

The stations collect data with many kinds of sensors. The robots and the mechanised arms need orders. Operators need to see the line and to change its parameters, at the line or from a tablet. And the line changes often, so the system must change with it.

01

Data from every station

Load cells weigh some pieces. Lasers measure distances. Pressure devices measure the force applied when two pieces are assembled.

02

Orders for robots and arms

The PLC processes the data and sends the orders to the actuators of the line: robots and mechanised arms.

03

More than one line

Select one line or another and apply its own parameters, from the same system.

04

A line that changes

The hardware can be modified and the software reprogrammed for every small change in the line.



Remote access through a VPN

The information can be reached from anywhere, through a VPN connected to the MQTT server. A typical reason for the VPN: the line does not have to be open to the internet.

HOW IT WORKS

Three stages: measure, command, watch.

Stage 1 · Measure at the station

Weigh, measure, press. The PLC reads each value.

The stations send their data to the PLC on analog inputs: the weight from a load cell, a distance from a laser, the assembly force from a pressure device. The PLC processes each value. A typical way to do it: compare each value with a window, release the part when all of them are in, and stop it with an alert when one is out. Pick a part and press. Run the station.

- Load cell, laser and force sensor on analog inputs
- Each value compared with a window (example)
- Result to the line and to the Panel PC

Stage 2 · Give the order

The order comes from the PLC or from the panel. The robot does the work.

The PLC sends the orders to the actuators of the line, such as robots and mechanised arms. The orders can be stored in the PLC, or the operator can change them on the Panel PC. The same system can select one line or another and apply its own parameters. Pick a line and a source, then press Start cycle.

- Orders stored in the PLC or sent from the Panel PC
- One line or another, each with its own parameters
- Digital/relay and analog outputs to the actuators

Stage 3 · Watch and manage

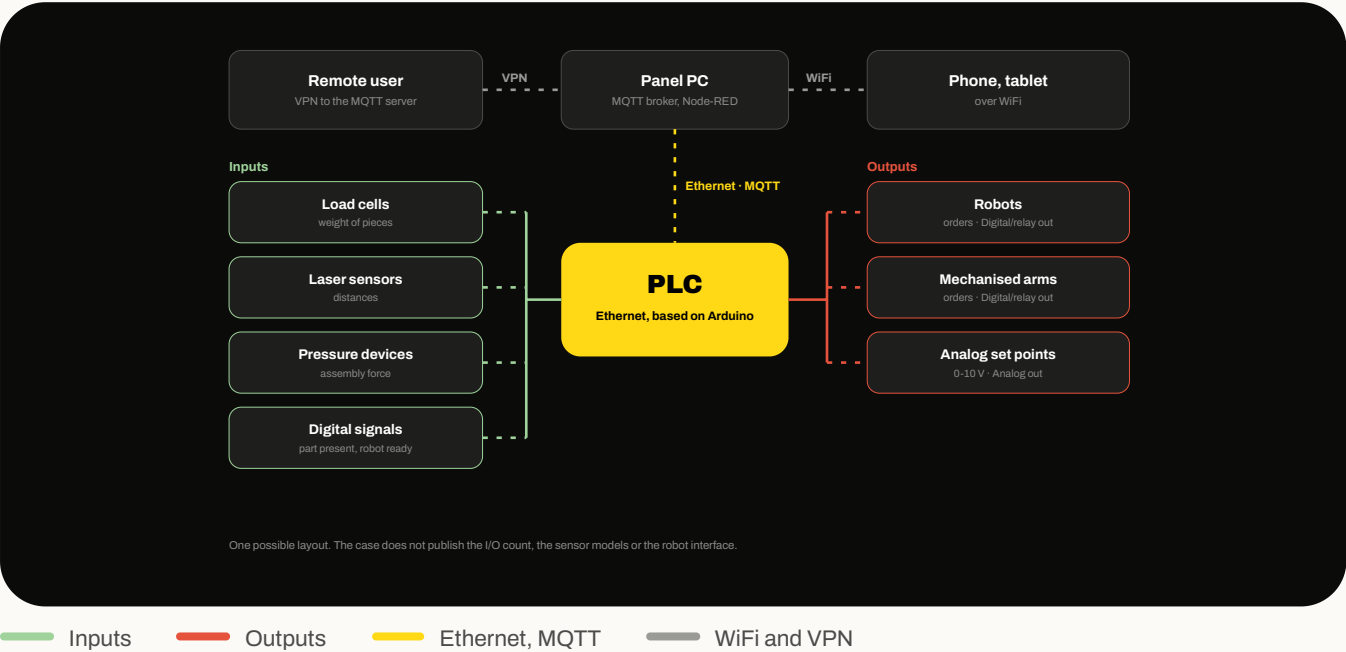
One broker, many screens: the panel, a tablet, a remote user.

The PLC sends its data to the Panel PC over Ethernet. On the Panel PC, an MQTT broker receives and sends the data between the PLC and the panel, and Node-RED shows them. A phone or a tablet reaches the panel over WiFi. From outside the plant, a VPN connects to the MQTT server. Pick a screen and a work area, then change a limit.

- MQTT broker and Node-RED on the Panel PC
- Phone or tablet over WiFi, remote users through a VPN
- Work areas divided in the interface

How does a PLC automate an automotive production line?

An Ethernet PLC based on Arduino reads the sensors of the stations on analog and digital inputs: load cells, lasers and pressure devices. It sends the orders to the robots and the mechanised arms on digital/relay outputs, and analog set points where an actuator takes one. Over Ethernet it exchanges data with a Panel PC that runs an MQTT broker and Node-RED. Phones and tablets reach the Panel PC over WiFi, and remote users through a VPN to the MQTT server.



Signals and data

Signal	Between	Type	Purpose
Weight of a piece	Load cell → PLC	Analog in	Weighs certain pieces. A weighing transmitter turns the millivolts into 0-10 V
Distance	Laser sensor → PLC	Analog in	Measures distances on the part or the line
Assembly force	Pressure device → PLC	Analog in	Measures the force applied when the pieces are assembled
States of the line	Sensors, robot → PLC	Digital in	Example: part present, robot ready, robot done
Orders to robots and arms	PLC → actuators	Digital/relay out	Execute the orders. Example: start and program number
Set points	PLC → actuators	Analog out	0-10 V, where an actuator takes an analog command
Line data and orders	PLC ↔ Panel PC	Ethernet, MQTT	Broker on the Panel PC. Monitoring and parameters with Node-RED
Monitoring and management	Panel PC ↔ phone, tablet	WiFi	The same screens away from the panel
Remote access	Remote user ↔ MQTT server	VPN	The information from anywhere

HARDWARE USED

An Ethernet PLC to run the line. A Panel PC to manage it.



M-DUINO ETHERNET PLC ARDUINO 38R

An industrial PLC built around an original Arduino Mega 2560, with Ethernet, RS-485 and RS-232, for DIN rail. It is programmed with the Arduino IDE. On this line it reads the load cells, the lasers and the force sensors, sends the orders to the robots and the arms, and exchanges data with the Panel PC over Ethernet.

Role	Station measurements, orders to robots and arms, data to the panel
Inputs	12: 8 analog/digital (0-10 V, 10-bit), 4 digital optoisolated (5 to 24 Vdc)
Outputs	22: 16 relays (230 Vac 4 A / 24 Vdc 2 A, resistive), 6 analog/digital/PWM (0-10 V)
Communications	Ethernet (W5500, RJ45), RS-485, RS-232, I2C, SPI
Built in	Real-time clock, microSD slot

The text of the case names an Ethernet PLC based on Arduino and does not fix the model. The product photo in the original case document is the M-Duino 38R, which is still in the catalogue. Size it for your line: the case says the inputs and outputs can be digital or analog, within the I/O of the device. If a line needs more, the M-Duino family has larger models, and several PLCs can send their data to the same Panel PC.

[See the M-Duino 38R >](#)



TouchBerry Pi Panel PC 10.1" FLEX

The management point of the line. An industrial Panel PC with a Raspberry Pi 4, connected to the PLC over Ethernet. It runs the MQTT broker and Node-RED, shows the data, lets the operator configure the parameters and serves the screens for phones and tablets over WiFi.

Role	MQTT broker, Node-RED, parameters, screens
Screen	10.1"
Computer	Raspberry Pi 4
Link to the PLC	Ethernet

The case uses a Panel PC based on a Raspberry Pi 3, and the old page links the 10.1" TouchBerry Pi. The current model is the TouchBerry Pi Panel PC 10.1" FLEX, with a Raspberry Pi 4. The family also has 7" and 18.5" models.

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

Measure in the process

Weight, distance and force are read while the part is in the station. A typical way to use them: act on each part (see stage 1).

Work areas in the interface

The monitoring interface is divided into work areas, so each team sees its own part of the line.

Open to change

The PLC is programmed with the Arduino IDE. When the line changes, you change the I/O or the program, not the whole system.

SIMILAR LINE?

Tell us your stations and your robots. An engineer will answer.

Tell us what each station measures, which robots and arms get orders, how many lines you run 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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