

HOME AUTOMATION · M-DUINO 19R

One PLC runs the house. One panel shows it.

Lights, air, blinds and alarms on one Arduino PLC, with a touch panel.

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


one PLC, one screen, every room

Schematic illustration

6

inputs on the
M-Duino 19R.
One room uses all six.

8

relays for lights, air and
blinds

GPRS

link that sends the alarms
to the phone

10.1"

touch panel with a
Raspberry Pi: the screen of
the house

THE CHALLENGE

Comfort, safety and recording. One system the user can understand.

The goal of the case is a system that collects information from sensors in different parts of the house and drives actuators. It acts on what the sensors read or on what the user has set before. The case groups the work in three areas: automation and control, security, and audio and video.

01

Light where someone is

A presence sensor in each room switches its light on. A room with nobody in it stays dark.

02

Air by temperature

A thermostat gives the room temperature to the PLC. The PLC turns the air conditioning on or off around the selected temperature.

03

Blinds and appliances

Motors on the PLC move the blinds up and down. Smart appliances talk to the panel over Bluetooth, an option you order with the panel.

04

Safe when nobody is home

A contact on each door and window says if it is open. When the house is empty, an opening starts the alarm.



Alarms that reach you away from home

Smoke and air quality sensors detect a fire or a gas leak. The PLC sends the alarm to your phone over GPRS. Cameras can send their images to the PLC, which saves them on its microSD card.

HOW IT WORKS

Three stages: run the rooms, protect the empty house, size the controller.

Stage 1 · Run the rooms

Presence turns the light on. Temperature turns the air on.

Each room has a presence sensor, and the PLC switches the light of that room with a relay. The thermostat gives the temperature on an analog input, and the PLC turns the air conditioning on or off around the set point. The blinds go up and down with a motor on the PLC. Press a room to put someone in it, move the temperature and move the blinds.

- Presence sensor per room, digital input
- Thermostat on an analog input, air on or off
- Blind motor on the PLC outputs

Stage 2 · Protect the empty house

Press a button when you leave. The PLC watches the doors and windows.

When you leave, you press a button. The program reads it and knows that nobody is in the house. If a door or a window opens, the alarm starts and you get a message on your phone. Smoke and air quality alarms are always on, at home or away. Press Leave home, wait for the alarm to arm, and open a window. Then try the smoke and the air quality.

- Leave button: the house is empty
- A door or window opened: intrusion alarm
- Smoke and gas alarms in every mode, over GPRS

Stage 3 · Size the controller

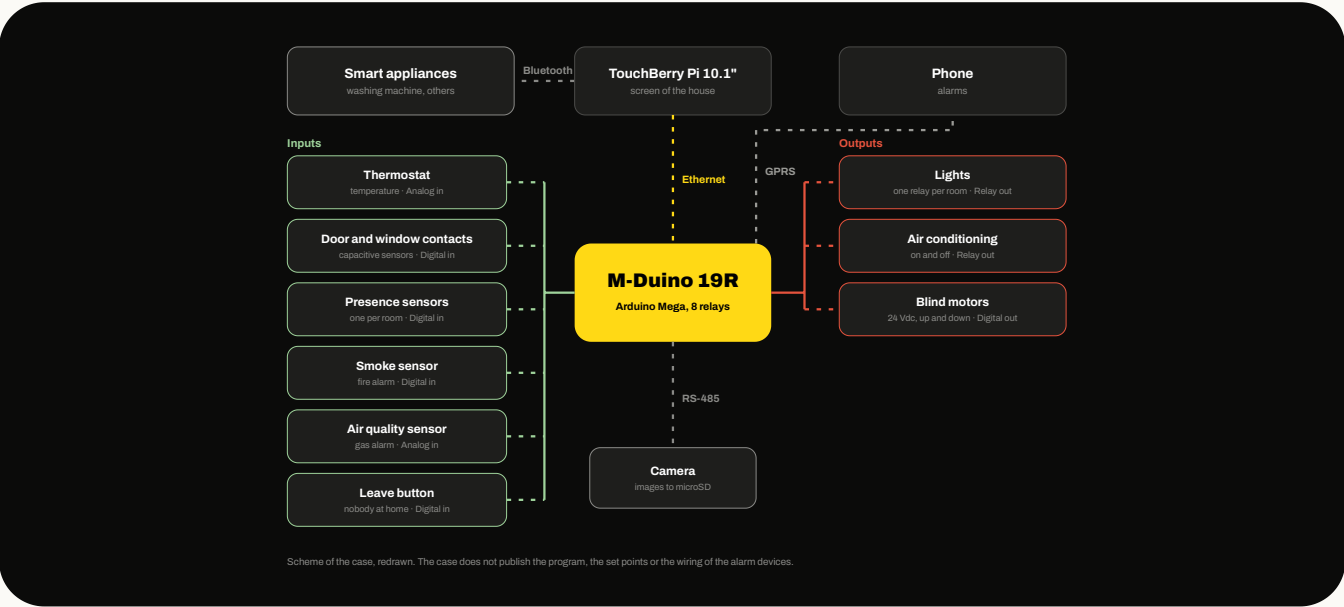
Count the sensors and the loads. Then pick the PLC.

The case uses a simplified model, and the M-Duino 19R fits it: six inputs and eight relays. A real house has more rooms, more doors and windows and more blinds. Each one adds an input or a relay. Move the sliders to count them, and see which M-Duino with relays still fits.

- Inputs: fixed sensors, plus rooms, plus doors and windows
- Relays: lights, air, blinds up and down
- Same program and wiring style on a larger M-Duino

How does a home automation system with a PLC and a touch panel work?

All the sensors are wired directly to the PLC. The thermostat and the air quality sensor go to analog inputs. The door and window contacts, the presence sensors, the smoke sensor and the leave button go to digital inputs. The PLC switches the lights, the air conditioning and the blind motors. A camera talks to the PLC over RS-485. The TouchBerry Pi panel is on Ethernet and is the screen of the whole system; in the case, it also talks to smart appliances over Bluetooth, an option on the panel. The GPRS link sends the alarms to the phone.



Signals and data

Signal	Between	Type	Purpose
Room temperature	Thermostat (temperature sensor) → PLC	Analog in	Turn the air conditioning on or off around the selected temperature
Door or window open	Capacitive sensor on each access → PLC	Digital in	Shows each access open or closed. With the house empty, an opening starts the alarm
Someone in the room	Presence sensor in each room → PLC	Digital in	Light in a room only when someone is there
Smoke	Smoke sensor → PLC	Digital in	Fire alarm to the phone
Air quality	Air quality sensor → PLC	Analog in	Gas leak alarm to the phone
Nobody at home	Leave button → PLC	Digital in	The program reads it and arms the intrusion alarm
Lights	PLC → relay → light of each room	Relay out	On with presence, off without it
Air conditioning	PLC → relay → on/off input of the unit	Relay out	On or off command. The relay does not carry the power of the compressor
Blinds	PLC → 24 Vdc motor	Digital out (or two relays)	Up and down. The scheme shows one output; a motor that turns both ways needs two, never on together
Camera	Camera ↔ PLC	RS-485	Images saved on the microSD card of the PLC (see the FAQ)
Screen	PLC ↔ TouchBerry Pi 10.1"	Ethernet	The user sees and controls the whole system
Smart appliances	TouchBerry Pi ↔ appliance	Bluetooth	The panel controls the appliance directly. Bluetooth on the panel is on request
Alarms	PLC → phone	GPRS	Fire, gas and intrusion alarms

A PLC with relays and a touch panel with a Raspberry Pi.



M-Duino Ethernet PLC Arduino 19R

An industrial PLC built around an original Arduino Mega 2560, with 6 inputs and 11 outputs, 8 of them relays, for DIN rail. In this case it reads every sensor of the house, switches the lights, the air and the blinds, and sends the alarms.

Role	All sensors, all loads, alarm logic
Inputs	6: 4 analog/digital (0-10 V, 10-bit, up to 24 Vdc as digital), 2 digital optoisolated (5 to 24 Vdc)
Outputs	11: 8 relays (230 Vac 4 A / 24 Vdc 2 A, resistive), 3 analog/digital/PWM (0-10 V)
Comms	Ethernet, RS-485, RS-232, TTL serial, I2C, SPI
Built in	Real-time clock, microSD slot

The case names the M-Duino 19R and asks for a model of the GPRS family, to send the alarms to the phone. The current model is the 19R+, shown here. The GPRS versions of the M-Duino are described in the family datasheet: ask us for this configuration.

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



TouchBerry Pi Panel PC 10.1" FLEX

The screen of the house: a Raspberry Pi 4 behind a 10.1" capacitive touchscreen, on Ethernet to the PLC. From it, the user sees and controls the whole system.

Role	User interface, smart appliances
Screen	10.1" IPS, 1280 x 800, capacitive, 900 nits
Computer	Raspberry Pi 4, Linux preinstalled
Own I/O	3 digital in, 2 analog in, 5 digital out
Comms	Gigabit Ethernet, 4 x USB, one serial port (RS-485, RS-232 or TTL). Wi-Fi and Bluetooth on request
Front	IP20 or IP65 on the FLEX version

The case names the TouchBerry Pi 10.1" with a Raspberry Pi 4. In the case, the panel talks to smart appliances over Bluetooth. On the TouchBerry Pi, Wi-Fi and Bluetooth are not included by default: ask for them when you order (family datasheet).

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

Relays on board

The M-Duino 19R has 8 relays, rated 230 Vac 4 A or 24 Vdc 2 A on a resistive load. Lights and on/off commands connect without an external relay board. For inductive loads, add an RC snubber; for large lighting groups, switch a contactor.

Alarms do not wait for the screen

The PLC reads the smoke, gas and door sensors and sends the alarms itself, over GPRS. A typical design keeps it that way: if the panel is off or restarting, the alarms still go out.

Room to grow

The same program style and the same wiring work on a larger M-Duino with relays, such as the [38R](#) or the [57R](#), when the house has more rooms, doors and blinds.

AUTOMATING A HOUSE OR A BUILDING?

**Tell us about your rooms and your alarms.
An engineer will answer.**

Tell us how many rooms, doors and windows, blinds and loads you have, which alarms you need and how you want to get them. We will propose a controller and a panel, and count the I/O with you.

READ IT ONLINE

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