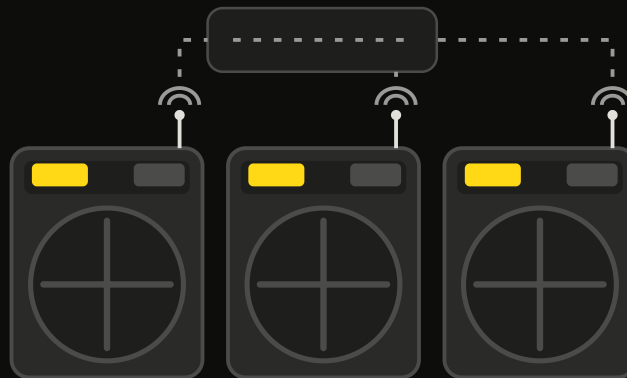


OEM LAUNDRY MACHINE · RASPBERRY PLC 58

One controller design. Every machine in the series.

The same PLC, panel and I/O in every laundry machine. Service over 4G.

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


same design in every machine

Schematic illustration

63

I/O on the Raspberry PLC
58: 39 inputs, 24 outputs

2

RS-485 ports: remote I/O
on one, the drive on the
other

4G

LTE Cat 4 board on the
PLC for remote service

7"

Linux touch panel, IP65
front on the FLEX version

THE CHALLENGE

One machine is a project. A series is a product.

A laundry machine builder ships the same machine to many laundries. Each machine needs the same control, the same screen and the same checks before it leaves the factory. The models change in size and options, and the builder does not want a new cabinet for each one. When a machine stops in a laundry far away, the service team needs to know why before a technician travels.

01

One bill of materials

Every machine in the series uses the same controller, the same panel and the same main cabinet.

02

Options without a new design

More dosing pumps or a water recovery tank add remote I/O modules on a bus. The main cabinet stays the same.

03

Tested before it ships

Each controller runs the same end-of-line test, and the result is saved with the serial number.

04

The builder's screen

The operator sees the machine builder's interface on the panel, with its own programs and menus.

Service from a distance, with a person at the machine



The machines work in laundries that the builder does not run. Over 4G, the controller sends its state and its alarms to the builder. A service engineer can read a fault and prepare a change. The change is applied only when the machine is stopped and a person accepts it on the panel.

HOW IT WORKS

Three moments in the life of each machine: configure, test, service.

Moment 1 · Configure

Three models, one main cabinet. Options go on the bus.

The base machine uses a fixed set of PLC inputs and outputs: door, safety status, level, temperature, water meter, valves, heating and the drive. Options that change from one order to the next, such as dosing pumps or a water recovery tank, go on moduleX remote I/O, on RS-485. The model size changes only a parameter set.

- Base signals on the Raspberry PLC 58
- Options on moduleX modules, Modbus RTU over RS-485

Moment 2 · Test at the end of the line

The same test for every serial number.

Before a machine leaves the factory, the controller runs one test program. It checks the panel link, the remote I/O, the analog signals, every output and the 4G link, and saves a report with the serial number. A wrong Modbus ID or a missing antenna stops the machine on the line, not at the customer.

- One test program on the PLC for the whole series
- The operator confirms what the PLC cannot see

Moment 3 · Service over 4G

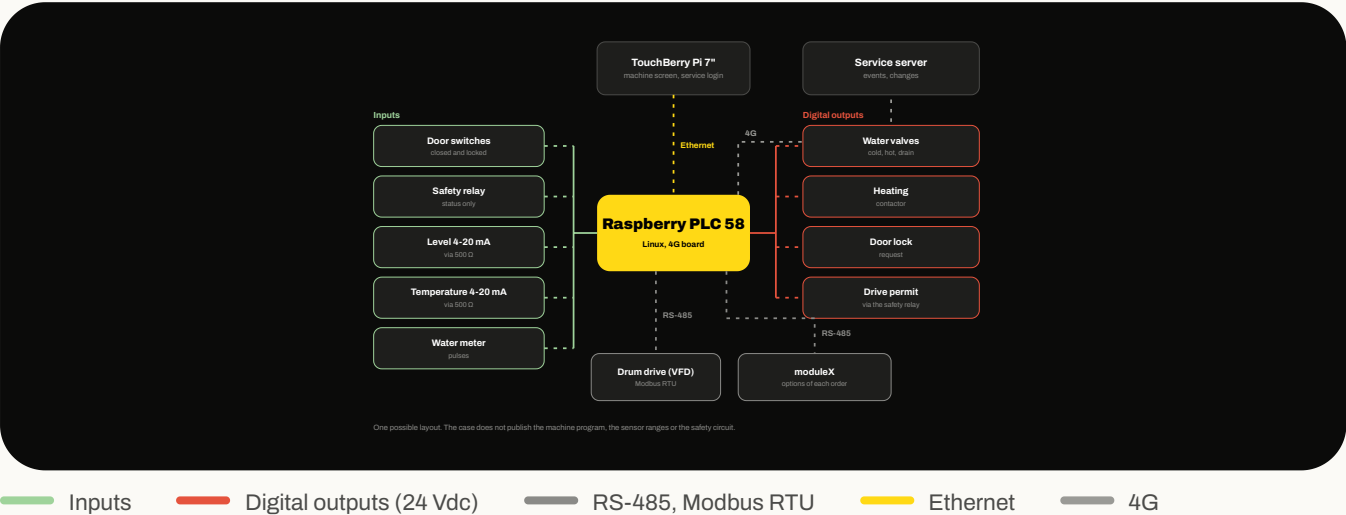
Events go out. Changes come in, and wait for a person.

In the laundry, the PLC sends its events over 4G: cycle start and end, faults with a code, changes accepted. If the link is down, it keeps the events and sends them later. The service team can send a new parameter, but the panel shows it as waiting, and the PLC applies it only when the machine is stopped and a person accepts it. Run a cycle, simulate a slow drain, cut the link, and send a change. To try machine states, downtime and alarms on a live line, open the [Machine Monitor simulator](#).

- Events with a code, kept while the link is down
- Remote changes wait for a stopped machine

How does an OEM build one controller into a series of laundry machines?

A typical way to do it: the Raspberry PLC 58 reads the door switches, the status of the safety relay and the water meter on digital inputs, and the level and temperature transmitters (4-20 mA, through 500 Ω converters) on 0-10 V inputs. Its digital outputs drive the water valves, the heating contactor, the door lock command and the drive permit, through interposing relays. The first RS-485 port reads the moduleX remote I/O for the options; the second talks Modbus RTU to the drum drive. The TouchBerry Pi panel is on Ethernet. The 4G board sends events to the service server.



Signals and data (example)

Signal	Between	Type	Purpose
Door closed, door locked	Door switches → PLC	Digital in	The cycle starts only with the door closed and locked. The interlock itself is a safety function (see the FAQ)
Safety circuit OK	Safety relay → PLC	Digital in	The PLC reads the status. It does not perform the safety function
Water level	Level transmitter 4-20 mA → 500 Ω converter → PLC	Analog in (0-10 V)	Fill to the level of each step. Well below 2 V (for example under 1.8 V, about 3.6 mA) means a broken wire
Water temperature	Transmitter 4-20 mA → 500 Ω converter → PLC	Analog in (0-10 V)	Heat to the temperature of each step
Water meter	Pulse output → PLC	Digital in	Water use per cycle
Cold, hot and drain valves	PLC → interposing relays → valves	Digital out	Fill and drain
Heating	PLC → interposing relay → contactor	Digital out	Electric heating on and off
Door lock, drive permit	PLC → lock and drive, via the safety relay	Digital out	Request to lock the door and to run the drum
Drum drive	PLC ↔ drive (VFD)	RS-485, Modbus RTU	Speed, direction, drive faults
Dosing pumps, low levels, recovery tank	PLC ↔ moduleX MX-8DO and MX-8DI	RS-485, Modbus RTU	Options of each order, on remote I/O
Operator screen	PLC ↔ TouchBerry Pi 7"	Ethernet	Programs, steps, alarms, service login, changes waiting
Events and changes	PLC ↔ service server	4G LTE Cat 4	Events out, kept while offline. Changes in, applied after a local accept

A controller, a panel and remote I/O. The same in every machine.



Raspberry PLC 58

An industrial PLC built around a Raspberry Pi 4, with 39 inputs and 24 outputs, two Ethernet ports, two RS-485 ports, Wi-Fi and Bluetooth LE, for DIN rail. It runs Debian 64-bit. In this pattern it runs the machine, reads the remote I/O and the drive on its two RS-485 ports, and sends the events over its 4G board.

Role	Machine control, remote I/O, drive, events over 4G
Inputs	39: 18 analog/digital (0-10 V, 12-bit), 21 digital optoisolated (5 to 24 Vdc)
Outputs	24: 9 analog/digital/PWM (0-10 V), 15 digital optoisolated (5 to 24 Vdc)
Comms	1 x Gigabit and 1 x 10/100 Ethernet, 2 x RS-485, Wi-Fi, Bluetooth LE, I2C, SPI

The image shows the Raspberry PLC 58. Choose the 4G (LTE Cat 4) expansion board when you configure it. The outputs are optoisolated transistor outputs, not relays: drive valves and contactors through interposing relays.

[See the Raspberry PLC 58 ›](#)



TouchBerry Pi Panel PC 7" FLEX

The operator panel of the machine: a Raspberry Pi 4 behind a 7" capacitive touchscreen, on Ethernet to the PLC. It shows the builder's interface, the programs, the alarms and the changes waiting for a person.

Role	Machine interface, alarms, local accept of changes
Screen	7" IPS, 1024 x 600, capacitive, 900 nits
Front	IP20 or IP65 on the FLEX version
Own I/O	3 digital in, 2 analog in, 5 digital out

The family also has a 10.1" model.

[See the TouchBerry Pi 7" ›](#)



moduleX Inputs Outputs Module

Remote I/O for the options of each order. A master module talks Modbus RTU over RS-485 to the PLC, and the I/O modules snap onto it. You choose the modules, and the enclosure is sized to your choice.

Role	Dosing pumps, low levels, recovery tank
Modules	MX-8DI, MX-8DO, MX-4AI, MX-4AOV
Bus to the PLC	RS-485, Modbus RTU slave, ID by DIP switch
Modules per master	Up to 6 in the enclosure of the configurable kit. The Xbus allows up to 16 per master, 10 ms refresh

[See moduleX ›](#)

The hardware does not change per model

The main cabinet, the PLC and the panel are the same in every machine. A model is a parameter set: drum size, water levels, times. One bill of materials is simpler to buy, stock and repair.

Room on the controller

The Raspberry PLC 58 has 39 inputs and 24 outputs. In this example the base machine uses 7 and 6 of them, so a new feature does not force a new controller.

Linux for the panel and the services

The PLC and the TouchBerry Pi run Linux. The machine interface can be a Node-RED dashboard that opens on boot in kiosk mode, with a service login for the technician.

BUILDING MACHINES IN SERIES?

Tell us about your machine and your series. An engineer will answer.

Tell us the I/O of the base machine, the options, the drive, the panel and how you want to service it. Tell us if it is one machine or a series. We will propose a configuration and how to test it.

FULL CASE STUDY ONLINE

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