

PLC and HMI Design Using Low-Cost Microcomputer

[A Programmable Logic Controller \(PLC\)](#) is a microcomputer used for industrial automation. These controllers can automate a specific process, machine function, or even an entire production line. A PLC receives information from connected sensors or input devices, processes the data, and triggers outputs based on pre-programmed parameters. Depending on the inputs and outputs, a PLC can monitor and record run-time data such as machine productivity or operating temperature, automatically start and stop processes, generate alarms if a machine malfunctions. PLC's are a flexible and robust control solution, adaptable to almost any applications. However, they are expensive in compared with other powerful microcomputer systems such as Raspberry Pi.



Figure: Industrial PLC with I/O modules

Problem:

The Raspberry Pi is a small and affordable microcomputer that can be used in many areas because of its low cost, modularity, and open design. A major drawback with using the Raspberry Pi as a PLC is the lack of industrial I/O capacity. This may require additional hardware, such as an ADC board as well as a custom board to condition the signals. The Raspberry Pi looks for 0-3 V inputs where industrial control applications are usually in the -10 to 10 V range and often use a 4-20 mA current loop.

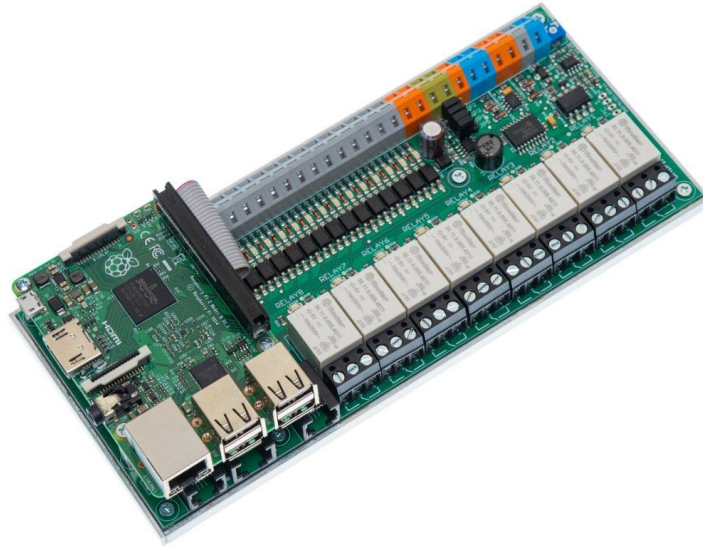


Figure: Unipi PLC with I/O pins

Objectives:

1. Creating a Raspberry Pi PLC that conform with the industrial form factor such as handling spike noise in a highly polluted electromagnetic wave environment
2. Creating a Ladder Logic Programming environment as a programming interface for the users to make it compatible with the current in-use PLC in industry
3. Making a dedicated human machine interface (HMI) using PI and a Touch screen to communicate with the designed PLC

There are companies that are trying to accomplish these objectives, such as [UniPi](#). Feel free to explore the companies such as this and their technologies for your reference.