

# Automatic Washing Machine Control System Based on PLC

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**Abstract:** In this project, a fully automatic washing machine control system based on programmable logic controller (PLC) is designed and implemented for the automation needs of household washing machines. The replacement of traditional relay control by PLC technology improves the reliability, flexibility and maintainability of the system. The system adopts Mitsubishi FX5U-64M PLC as the core controller, combined with GT Designer3 touch screen software to achieve human-computer interaction, and supports automatic control of the whole process such as washing, rinsing, and dehydration. The experimental results show that the system can automatically complete the laundry process according to the parameters set by the user (such as water level, washing times, and spinning time), and has the functions of fault alarm, status monitoring and historical data query. By optimizing the program logic and hardware configuration, the system achieves the expected goals in terms of cost, efficiency and user experience.

**Keywords:** Fully Automatic Washing Machine; PLC; Touch Screen; Automated Control.

## 1. Introduction

As a household essential electrical appliance, the level of automation of washing machines directly affects the user's experience. Traditional washing machines are mostly controlled by mechanical or relay control, which has problems such as poor flexibility, high failure rate, and insufficient scalability. With the development of PLC technology, its high reliability, strong anti-interference ability and flexible programming characteristics in industrial control have been gradually applied to the field of home appliances. In this paper, a fully automatic washing machine control system is designed based on Mitsubishi FX5U PLC, which realizes parameter setting and status monitoring through the touch screen, which significantly improves the intelligent level of the system.

Well-known foreign brands (such as Siemens and Panasonic) have launched a variety of PLC-controlled smart washing machines, which support functions such as clothing weight perception and adaptive program adjustment. Domestic universities and enterprises are also conducting research in this field, but most systems still have problems such as high cost and single function. With the goal of low cost and easy maintenance, this design combines PLC and touch screen technology to achieve fully automatic control and user-friendly interaction of the laundry process.

## 2. General Design of System

The design of the fully automatic washing machine control system based on PLC is mainly composed of the following parts:

**Input device:** This section includes various sensors and switches for detecting the status of the washing machine and receiving user instructions. For example, a water level sensor is used to detect the water level, a door switch is used to detect the status of the door, and a touch screen or button is used to input instructions by the user.

**PLC (Programmable Logic Controller):** PLC is the core of the control system, responsible for receiving data from input

devices and performing data processing and output control according to preset program logic. A PLC will typically contain a microprocessor and memory for storing and executing programming logic.

**Output equipment:** This part includes actuators such as motors, solenoid valves, etc., which are used to drive and control various actions of the washing machine. For example, a motor is used to drive the rotation of the laundry basket, and a solenoid valve is used to control water inlet and drainage.

**Human-machine interface (HMI):** HMI is used to display the status information of the washing machine and receive user instructions. It can be achieved through a touch screen, an LED display or an LCD display.

**Communication interface:** This part is used to realize the communication between the PLC and other devices or systems, such as data exchange with the upper computer software. Common communication interfaces include serial communication, Ethernet communication, etc. System framework

As shown in the figure below:

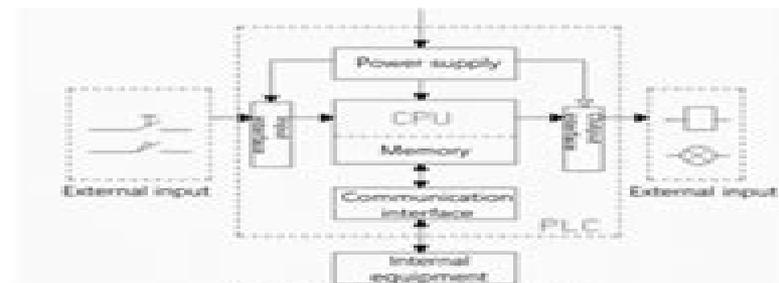


Figure 1. System composition

The main working principle of washing machine:  
First, set the number of washing and rinsing times, throw

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