

Simatic S5 and Simatic S7

Distributed Control Systems
for Industrial Automation

Siemens



Product PDF

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1 System Overview

The SIMATIC® S5-115U programmable controller is used worldwide in almost all fields in a wide range of applications. Each of its modular components handles a specific task. Therefore, you can expand the system according to your needs. Three types of communications systems pass information among multiple controllers. The S5-115U system provides operator panels, monitoring devices, and various programmers to suit your needs. The STEP 5 programming language and an extensive software catalog make programming easy.

1.1 Application

Many different industries use the S5-115U. Even though each automation task is different, the S5-115U adapts optimally to the most varied jobs, whether they involve simple open-loop control or complex closed-loop control.

Present areas of application include the following:

- **Automobile Industry**
Automatic drill, assembly and test equipment, painting facilities, shock absorber test beds
- **Plastics Industry**
Blow, injection, and thermal molding machines, synthetic production systems
- **Heavy Industry**
Molding equipment, industrial furnaces, rolling mills, automatic pit shaft temperature control systems
- **Chemical Industry**
Proportioning and mixing systems
- **Food and Beverages Industry**
Brewery systems, centrifuges
- **Machinery**
Packing, woodworking, and custom-made machines, machine controls, machine tools, drilling mills, fault alarm centers, welding technology
- **Building Services**
Elevator technology, climate control, ventilation, lighting
- **Transport Systems**
Transport and sorting equipment, high-bay warehouses, conveyor and crane systems
- **Energy, Gas, Water, Air**
Pressure booster stations, standby power supply, pump control, water and air treatment, filtering and gas recovery systems

1.2 System Components

The S5-115U system is made up of various modular components, as pictured in Figure 1-1. These components include the following:

- power supply module (PS)
- central processing unit (CPU)
- input and output modules (I/Os)
- intelligent input/output modules (IPs, WFs)
- communications processors (CPs)

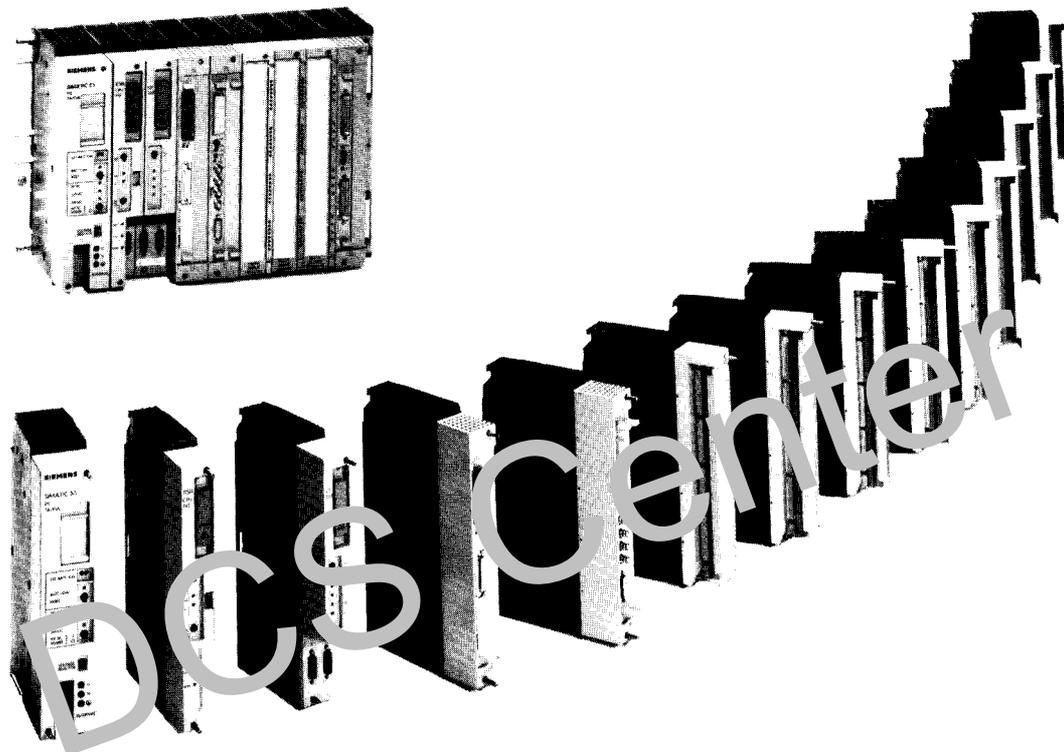


Figure 1-1. S5-115U Components

1.2.1 Power Supply

The power supply module (PS) converts the external power supply to the internal operating voltage. Supply voltages for the S5-115U include 24 V DC, 120 V AC, and 230 V AC.

Screw-type terminals connect the power supply lines to the bottom of the PS. Three maximum output currents are available. Choose 3 A, 7 A, or 15 A according to the number of modules you have or according to their power consumption. A fan is not necessary for output currents up to 7 A.

A lithium battery backs up the program memory and the internal retentive flags, timers and counters in the event of a power failure. An LED signals battery failure. If you change the battery when the power is shut off, connect a back-up voltage from an outside source to the sockets provided for this purpose on the power supply module.

1.2.2 Central Processing Units

The central processing unit (CPU) is the "brain" of the programmable controller. It executes the control program. Choose from the following four CPUs, depending on the degree of performance your S5-115U must have:

CPU 941, CPU 942, CPU 943 and CPU 944.

The more powerful the CPU you choose, the shorter are your program execution times and the larger the user memory. You can use CPUs 941 to 944 also for PID control - in conjunction with analog modules and PID control software - since the operating systems in these CPUs contain integral PID control algorithms. Sampling times from 100 ms are possible for a PID control loop. You can implement up to eight PID control loops.

CPU 943 and CPU 944 (each with two serial interfaces) offer further possibilities for controlling the process thanks to their integral hardware clock.

1.2.3 Input and Output Modules

Input and output modules are the interfaces to the sensors and actuators of a machine or controlled system.

The following features make S5-115U modules easy to handle:

- fast installation
- mechanical coding
- large labeling areas

Digital Modules

Digital modules conform to the voltage and current levels of your machine. You do not have to adapt the existing level to the programmable controller. The S5-115U adapts itself to your machine.

Digital modules have the following convenient features:

- connection of signal lines via front connectors
- a choice of screw-type or crimp snap-in connections

Analog Modules

As a programmable controller's degree of performance increases, so does the significance of its analog value processing. The significance of the analog input and output modules increases accordingly.

Analog modules handle mainly closed-loop control tasks, such as automatic level, temperature, or speed control.

The S5-115U offers floating and non-floating analog input modules. They use one range card for every four channels to adapt the desired signal level.

This feature allows you to do the following:

- have up to four different measuring ranges on one module, depending on the number of channels a module has
- change the measuring ranges simply by exchanging range cards

Three analog output modules cover the various voltage or current ranges of analog actuators.

1.2.4 Intelligent Input/Output Modules

Counting rapid pulse trains, detecting and processing position increments, measuring time and speed, closed-loop control, and positioning are just a few of many time-critical jobs. The central processor of a programmable controller usually cannot execute such jobs fast enough in addition to its actual control task. The S5-115U provides intelligent input/output modules (IPs) to handle these time-critical jobs. Use these modules to handle measuring, closed-loop control, and open-loop control tasks rapidly in parallel to the program.

Most of the modules have their own processor to handle tasks independently. All these modules have a high processing speed and are easy to handle. Standard software puts them into operation.

1.2.5 Communications Processors

The S5-115U offers a number of intelligent communications processors (CPs) to make communication easier between man and machine or machine and machine.

The two main groups of CPs are as follows:

- CPs for local area networks
- CPs for linking, signalling, and logging

1.3 Expansion Capability

If the connection capability of one central controller (CC) is no longer sufficient for your machine or system, increase the capacity with expansion units (EUs).

Interface modules connect a CC to EUs and connect EUs to each other. Choose an interface module suitable to the controller configuration you need.

1.3.1 Centralized Configuration

A centralized configuration allows you to connect up to three EUs to one CC. The interface modules for this purpose connect bus lines and supply voltage to the EUs. The EUs in such configurations therefore need no power supplies of their own. The cables between the individual controllers have a total maximum length of 2.5 m (8.2 ft.).

1.3.2 Distributed Configuration

A distributed configuration allows you to relocate expansion units nearer to the sensors and actuators of your machine.

Distributed configurations reduce cabling costs for these devices.

1.4 Communications Systems

Controller flexibility is critical to manufacturing productivity. Complex control tasks can be divided and distributed over several controllers to achieve the greatest flexibility possible.

Distribution offers the following advantages:

- small units that are easier to manage. You can plan, start up, diagnose, modify, and operate your system more easily, and observe the entire process more easily
- enhanced system availability because, if one unit fails, the rest of the system continues to function

Information must flow between distributed controllers to ensure the following:

- data exchange between programmable controllers
- central monitoring, operation, and control of manufacturing systems
- collection of management information such as production and warehousing data

For this reason, we offer the following communications facilities for the S5-115U programmable controller:

- Point-to-point connection with the CP 524 and CP 525 communications processors
- Local area network communications via the SINEC L1 network
- Industrial Ethernet
- PROFIBUS
- Point-to-point connection with the CPUs 943 and 944
- ASCII interface (in CPU 943 and CPU 944) for connecting printer, keyboard, etc.
- Computer connection with 3964/3964R protocol (in CPU 944)

1.5 Operator-Process Communication, Monitoring, and Programming

Today, users expect good process visualization with the capability to intervene where necessary. Previously, they had to hard wire indicating lights, switches, potentiometers, and pushbuttons, even for simple requirements. For more complex processes, they had to use expensive video display terminals. Inflexible or expensive solutions are a thing of the past.

In price and performance, the S5-115U offers you a graduated spectrum of operator panels and monitoring devices - from a small hand-held operator panel to a convenient color video display terminal.

The S5-115U enables you to react optimally to the most varied automation requirements, even where programming is concerned.

To help you with this, the following graduated and compatible spectrum of programmers is available:

- the economical PG 605U hand-held programmer
- the PG 635 in briefcase design with swing-up liquid crystal display
- PG 685 with CRT-based user friendliness
- PG 710
- PG 730
- PG 750
- PG 770

All the programmers feature high performance, simple handling, user-friendly operator prompting, and the standard, easily learned STEP 5 programming language.

1.6 Software

Until now, prices for hardware components tended to drop constantly and prices for software tended to increase. The reasons were as follows:

- the processes to be automated became more and more complex
- safety requirements increased
- personnel costs increased
- ergonomic demands increased

Siemens has put an end to this trend. SIMATIC provides the following three solutions to keep software costs down:

- the user-friendly STEP 5 programming language with its four methods of representation and convenient structuring capabilities
- an extensive software catalog
- user-friendly programmers

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