

## APPLICATION OF THE PROGRAMMABLE LOGIC CONTROLLER GLOFA-GM7 IN INDUSTRY

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Annotation. The paper discusses the application of PLC in industry and also the different parts of typical scheme and methods of connection it and programming. The paper is provided with 5 figures.

The purpose of our research to familiarize with the structure of PLC GLOFA-GM7, to explore ways of further use of the PLC in various industries, in particular, as a process control device depending on the temperature.

From the dawn of humanity, people have tried to simplify their work. Ancient people made tools out of sticks and stones. People of medieval smelt iron tools. Later steam engines and assembly-line production were invented. Now, in the 21st century, mankind tries to simplify their labor, but also people try to do most of their activities using machines. 21 century is the century of high technologies. Almost all areas of production are controlled by automatic control systems. The main elements of the ACS are MC and PLC. In our work, we consider one of the PLC - GLOFA-GM7.

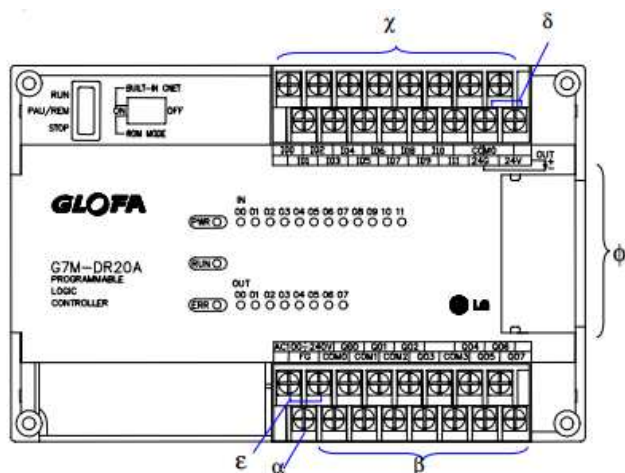
What is a PLC? PLC or Programmable Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory. A PLC is an example of a hard real-time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result.

Before the PLC, control, sequencing, and safety interlock logic for manufacturing automobiles was mainly composed of relays, cam timers, drum sequencers, and dedicated closed-loop controllers. This system was very massive and expensive. To change the logic, electricians needed to individually rewire relays. Early PLCs were designed to replace relay logic systems and simplify the management of ACS. Nowadays PLC is used in almost all spheres of production.

Glofa-GM7 - modular PLC. The basic meaning of modular PLC has only one control module and you can easily adapt your PLC to different specific task, using a variety of additional I / O modules, relay modules, communication modules (Cnet, Ethernet), and others.

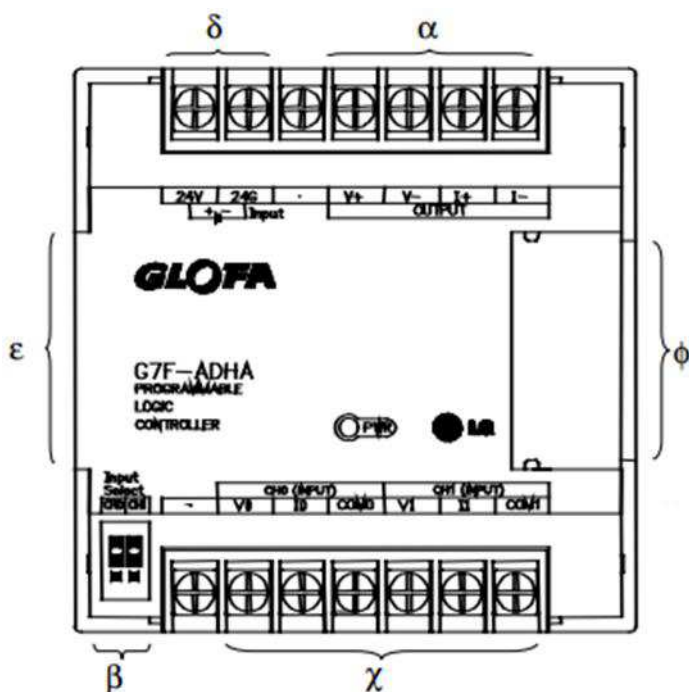
In our work we use two units: a control module G7M-DR20A, and A/D-D/A I/O Combination Module G7F-ADHA. Let's consider the wiring diagrams of each.

20-point base unit G7M-DR20A



No.	Names
	Frame and line ground
β	Output circuit
ε	Block for supply (AC 100-240V)
δ	24V DC power supply(can be used to supply the module)
χ	input circuit
φ	Expansion Cable Connecting Terminal

Figure 1. Control module G7M-DR20A



No.	Names
α	Analog Output Terminal
β	Analog Input (Voltage/current) selecting jumper pin
ε	Expansion Cable
δ	External Power Supply Terminal (DC24V)
χ	Analog Input Terminal
φ	Expansion Cable Connecting Terminal

Figure 2. A/D•D/A I/O Combination Module G7F-ADHA

Connection between the PC and the PLC carried out via RS232C interface and ModBus protocol.

RS-232 is a standard for serial communication transmission of data. It formally defines the signals connecting a DTE (data terminal equipment) such as a computer terminal, with a DCE (data circuit-terminating equipment, originally defined as data communication equipment), such as a modem. The RS-232 standard is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors. It is recommended to use the standard DB-9 for connecting.

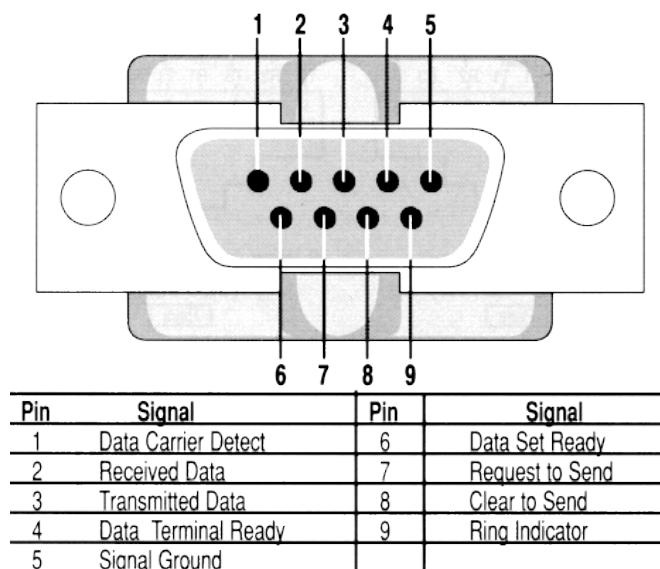


Figure 3. DB-9 connector

For programming this PLC, we use GMWin software. In this program we can choose one of three available programming languages. We consider one of them. It's a ladder diagram language. Syntax of this language is convenient for replacement of first logical circuits, formed on the relay technique. GMWIN is focused for engineers working in the automation industry. It provides intuitive interface of controller logic. It facilitates not only the task of programming, but also rapid troubleshooting in the equipment, connected to the controller. In this picture you can see some example of program.

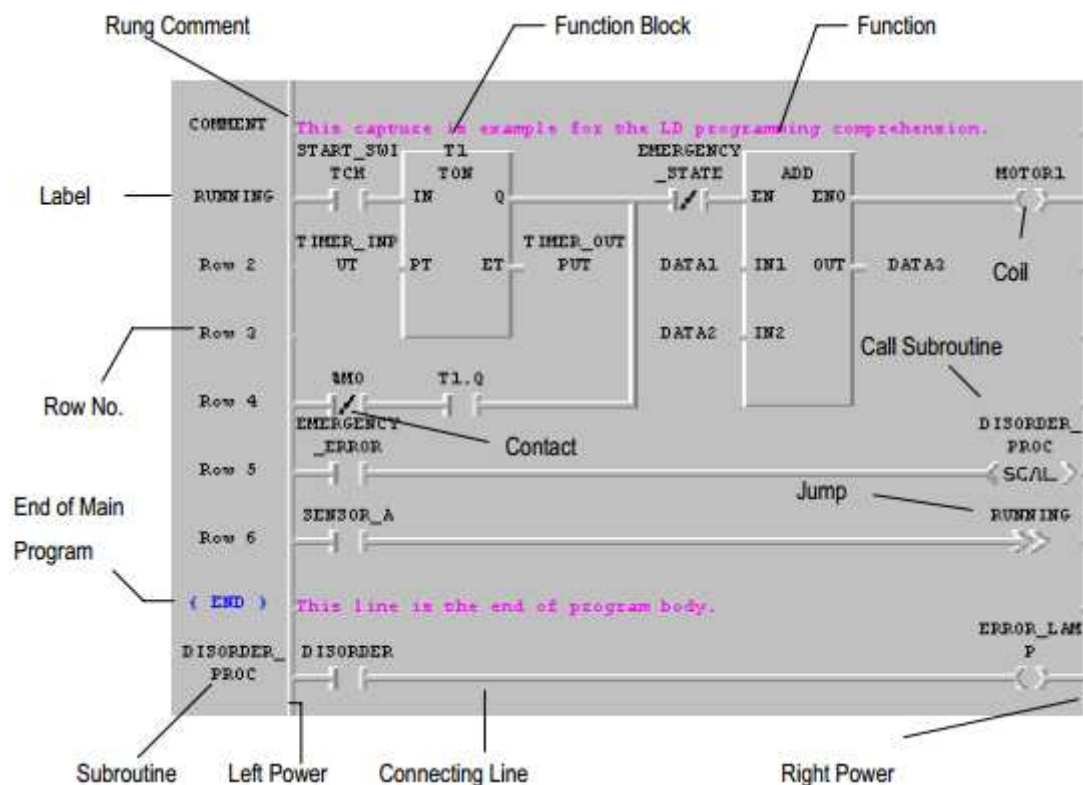


Figure 4. GMWin software

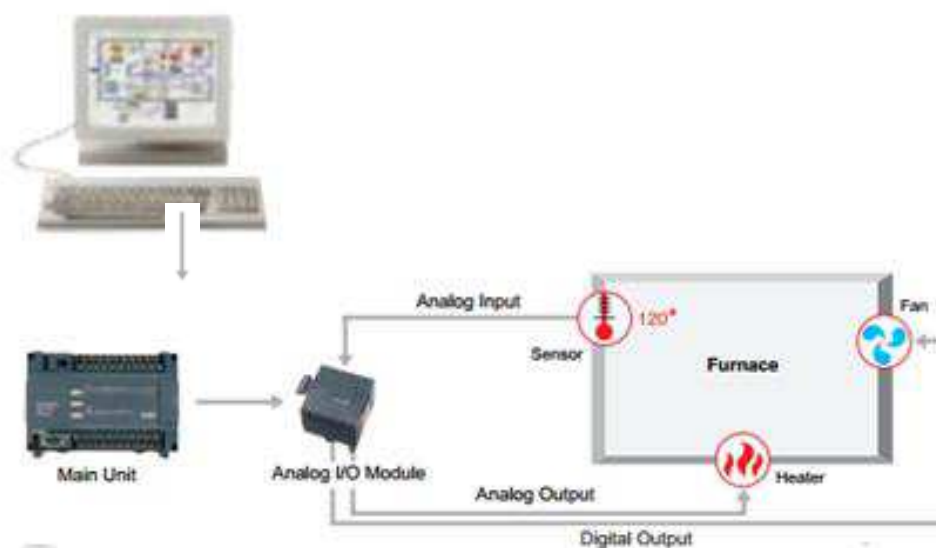


Figure 5. Typical scheme of use the PLC in industry

In this scheme we can see how PLC GLOFA-GM7 can control the temperature in furnace, for example. Data from temperature sensor arrive on Analog I/O module. Main unit takes this data from it, and analyzes it. Depending on the received results, GLOFA forms control action, which manages the temperature in furnace.

#### Trace Mod

For visualization of process in the scheme we used the most perspective Russian SCADA system Trace Mode. The result of the use of this package is Project. Project is the set of interpreted files. In this file the control algorithms for automatic control of different unit of ACS are programmed.

At the moment we are performing the connection of thermistor to PLC, which allows to measure the temperature in the investigated object. The received data is processed in the PLC and handled according to algorithm, written on GMWIN. The temperature is also sent to the PC. In the future it is necessary to consider the devices to regulate temperature and to develop an algorithm that allows to manage these devices.