

USAGE MICRO-CPU'S SYSTEMS IN ELECTRICAL POWER ENGINEERING

Jan Škoda

Doctoral Degree Programme, FEEC BUT
E-mail: xskoda05@stud.feec.vutbr.cz

Supervised by: Petr Baxant

E-mail: baxant@feec.vutbr.cz

ABSTRACT

The paper describes the use of the microprocessor system in electrical power engineering. It deals with the using of the compact control and the micro controller system for temperature regulating in the resource area. Further, there is described the using of SCADA system Promotic for regulating and monitoring of the status loop regulating quantities.

1. INTRODUCTION

At present the sphere of the microprocessors isn't related only with Personal computers, but it interferes in the technology and electrical power engineering too. A smart solution how to regulate the technological processes is to use the compact control systems or micro controllers. During the feeding resources installation into the electrical power engineering institute resource area, there arises the problem with heat sink, which is produced by high-powered elements of resources. There is necessary to cool this space and by this way, we can avoid the accident of the installation mechanism. For temperature control in the resource area, there is used the compact control system together with micro controller AT-MEL Atmega16.

2. THE CONTROLL OF THE RESOURCE AREA

The Controlling of the resource area is solved with the compact control system AMINI 2D by the Czech producer AMiT, which is fitted out with the communication module ETHERNET and there are analog digital inputs and outputs too.



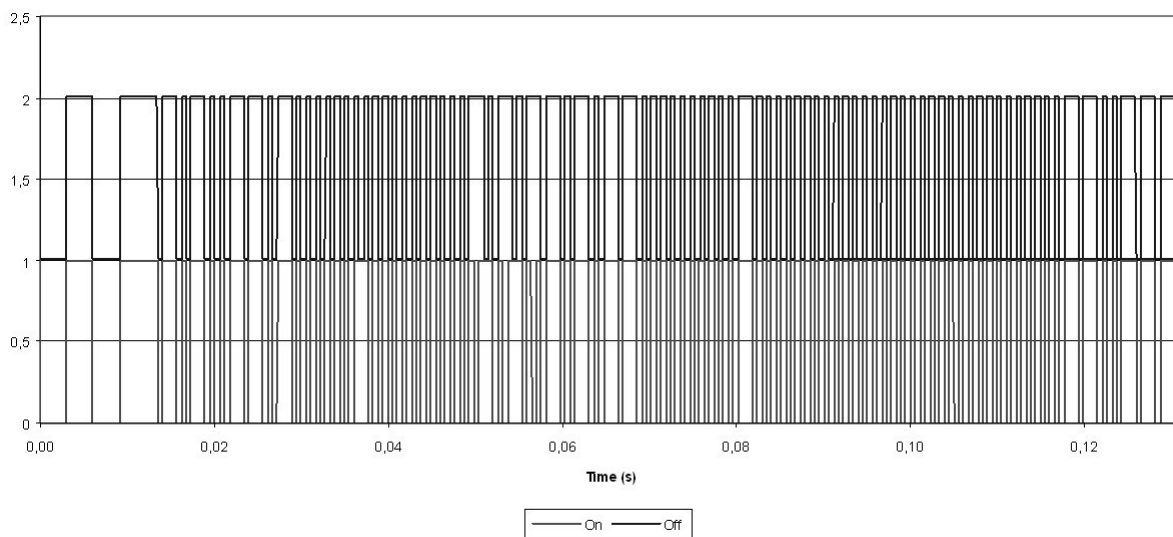
Obrázek 1: Compact control system AMiNi 2D [1]

To keep the safety temperature in the resource area there is used one analog input connected to the temperature sensor Ni 1000. Air conditioning (AC) should be switched off during inaction of the sources because of electric power consumption. It's necessary to the remote control AC for switching it on and off. For security reasons, there is used one digital output of the compact control system. IR remote control serves for the manual AC switching. The remote control can monitor all necessary functions too (required temperature, cooling intensity, sweeping, exact time).

The first problem appeared during the first solution, where was the absence of any external inputs. Because of that, it's necessary to solve all the automatic AC control by IR input.

3. THE TELEGRAM OF THE ORDERS

For security of the leading information transfer from the transmitter into the receiver (AC) we should modulate the data code on the support frequency 38,4 kHz. In practice, it means to make the IR LED blink in the time of lasting high logical modulating frequency unities. Unfortunately digital outputs of the compact control system AMiNi 2D are frequently limited to 1 kHz. That's why of the transition of the orders for AC there is used external micro controller with inside memory, which guarantees this function without any problems. Ordering of this micro controller is made from the digital outputs of the compact control system.

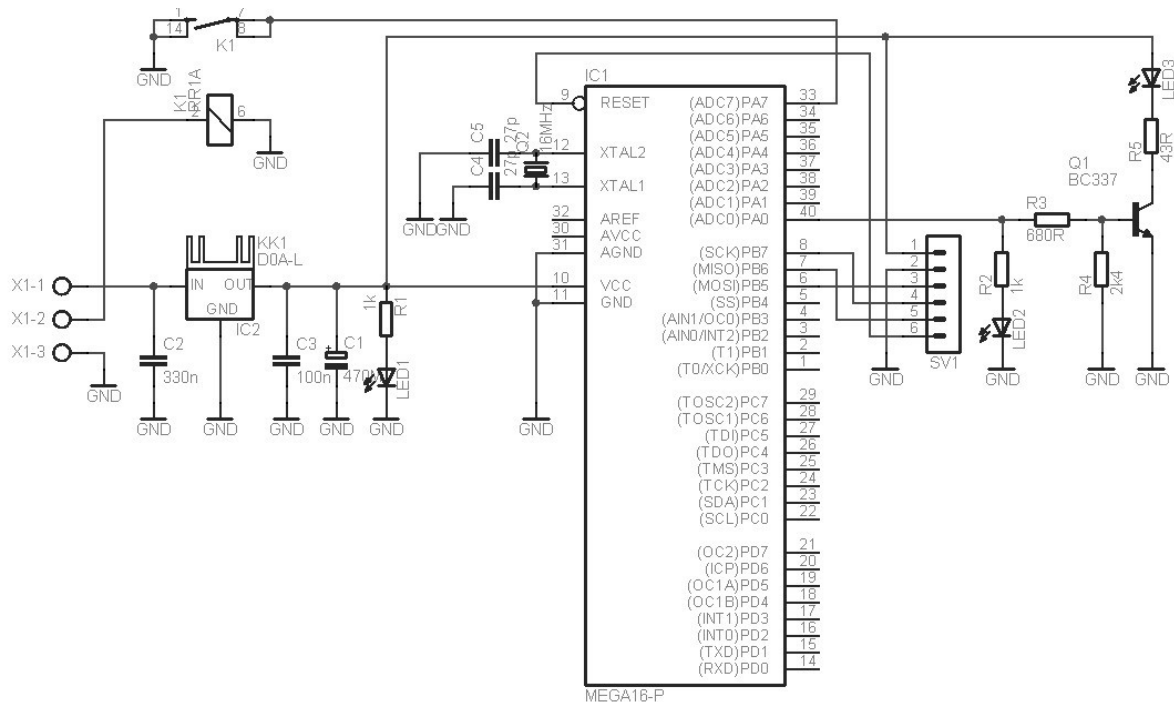


Obrázek 2: The process of the data signal information for switching on and off

How can we see from the previous figure, the data tread information is very difficult. It's because of the reason that the whole telegram has to contain full information about the AC setting (required temperature, cooling intensity, sweep, exact time). As the telegram transmits the exact time, the order for switching is different every minute. Because of that just the most suitable signal was chosen for each order and that one was programmed into the micro controller memory.

4. THE MICROCONTROLLER CIRCUIT

The supply voltage 5V is needed to provide for the micro controller circuit, and that's why the stabilizer 7805 is connected into the circuit Atmega16. Every hour signal is generated by the crystal 16 MHz. All necessary components for running of the micro controller including „pull-up“ resistors are connected inside of the integrated circuit. But we have to strengthen the current output from the micro controller to have the current 60mA in the IR LED. For this reason we have an external transistor BC 337.



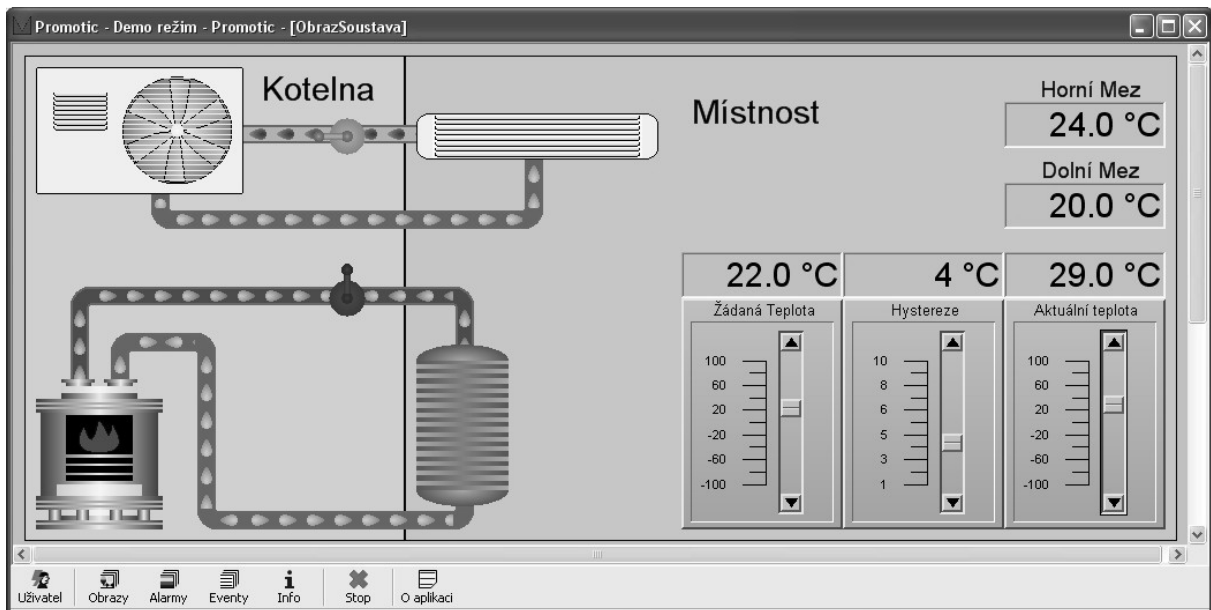
Obrázek 3: The scheme of transmitter connecting

5. THE FUNCTION OF THE REGULATOR

The compact control system gets the whole regulating process. There is connected the resistance temperature sensor on its own analog input. On the basis of the temperature measures the system can analyse an action order (turn on and off AC). As the turning on/off sequence is set to 20 degrees Celsius, we can regulate the temperature with this system above 20 degrees Celsius.

6. MONITORING AND REGULATING

We can use SCADA system PROMOTIC for monitoring and regulating. In this program we can define monitoring of the quantities measured with the compact control system very easy. Because the control system AMiNi 2D is fitted out the dividing line of the ETHERNET we can regulate and monitored the system on the internet. ActiveX library supplying by the producer of the compact control system guarantees downloading of the quantities.



Obrázek 4: The example of application in PROMOTIC

In the figure 4, there is shown an application made by students in the subject „Informační a řídicí systémy v elektroenergetice“. The application simulates the keeping of the constant temperature in a room. On the basis of settings the inside variables, the system decides on heating or cooling. We can form the monitoring program for regulating system of all quantities in the resource area.

7. CONCLUSION

The described mechanism is set up and really tuned. It works without any problems. Modern compact control systems extend an area of regulating and measuring. They give possibilities to remote control with the internet and thank to ETHERNET dividing line. The compact control systems are getting on Personal computers because of their own intelligence and integration of many dividing lines. The compact control is a very cheap solution of the powerful PC unit.

REFERENCES

- [1] Domovská stránka firmy AMiT s.r.o., www.amit.cz
- [2] Matoušek, D.: Práce s mikrokontroléry ATMEL AVR ATmega 16, BEN 2006, ISBN 80-7300-174-8