ACQUISITION SYSTEM FOR TEMPERATURE MONITORING AND CONTROL IN SIX MEASUREMENT POINTS MADE USING PIC16F877A MICROCONTROLLER

Antonie Nicolae [1], Borcosi Ilie [2],Cozma Vasile [3]

[1] *"Constantin Brâncuşi" University from Târgu Jiu*
[2] *"Constantin Brâncuşi" University from Târgu Jiu*
[3] *"Constantin Brâncuşi" University from Târgu Jiu*

ABSTRACT. In industrial applications and beyond, temperature measurement is one of the most common situations. In this paper we present the development of a data acquisition system for temperature monitoring and control in two chambers, a system built around a core type PIC16F877A microcontroller.

СИСТЕМА ЗА МОНИТОРИНГ НА ТЕМПЕРАТУРАТА И КОНТРОЛ В ШЕСТ ИЗМЕРВАТЕЛНИ ПУНКТА, **ОСЪЩЕСТВЕНА С МИКРОКОНТРОЛЕР** PIC16F877A

Антони Николае[1], ***Боркози Илие***[2], ***Козма Василе***[3]

[1] *"Университет „Константин Бранкузи" от Търгу Жиу*
[2] *"Университет „Константин Бранкузи" от Търгу Жиу*
[3] *"Университет „Константин Бранкузи" от Търгу Жиу*

РЕЗЮМЕ: In industrial applications and beyond, temperature measurement is one of the most common situations. In this paper we present the development of a data acquisition system for temperature monitoring and control in two chambers, a system built around a core type PIC16F877A microcontroller.

The description of development PIC16F877A

The PIC16F877A Microcontroller is part of the 8-bit PIC microcontrollers family, has a complex internal structure, is able to acquire analog signals having constituted an analog-digital 10-bit, can generate PWM signals, can communicate with external devices lends itself particularly well in industrial applications.

It presents five bidirectional ports configurable for use by installation and can be used in very complex applications.

In this paper we propose creation of a data acquisition system for temperature monitoring and control in six chambers.

The block diagram used for temperature monitoring is shown in the figure 1.

The LM35 temperature sensor is part of integrated sensors and measurement range is between -55 and 150 degrees Celsius.

The analog signals taken from the temperature sensors LM 35 type are applied to two of the microcontroller analog inputs which are converted via an analogue incorporeted digital converter.

All these signals are processed by the microcontroller through the program written in his memory.

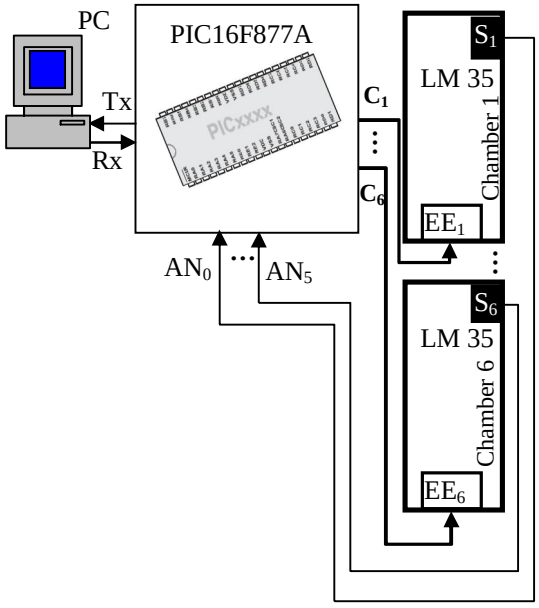

Fig. 1. The block diagram used for temperature monitoring

The processed data are submitted by the serial to a computer that running a software purchase which serves to display signals in graphical form and the human operator using an interface can view the processed data and can intervene by setting certain parameters for alarm, etc.

The proposed acquisition system can be extended to other applications by adapting the signals to the system requirements, by modifying the program written in program memory of the microcontroller to the new arrangement and operator interface running on the computer.

The serial module transmission of the data between the microcontroller and the computer circuit is provided with optocouplers for galvanic isolation so that a fault can occur in the purchasing system will not cause damage to computer systems and vice versa.

The electronic signal acquisition diagram used is shown in the figure 2.

The LM35 temperature sensor is part of integrated sensors and measurement range is between -55 and 150 degrees Celsius.

Integrated transducers for measuring temperature are first integrated transducers occurred. Although their measurement range is not too large (- 50, 1500 C), they are a number of applications from measuring ambient temperature, but also to measure other quantities through temperature variations from these quantities.

Are widespread two types of integrated sensors for temperature measurement:
- Output current transducer that varies in direct proportion to absolute temperature;
- Sensors that output voltage varies in direct proportion to absolute temperature.

For the first category is representative AD590 circuit (Analog Devices product - U.S.).

In the second category presents the integrated circuit LM 35 (National Semiconductor - USA).

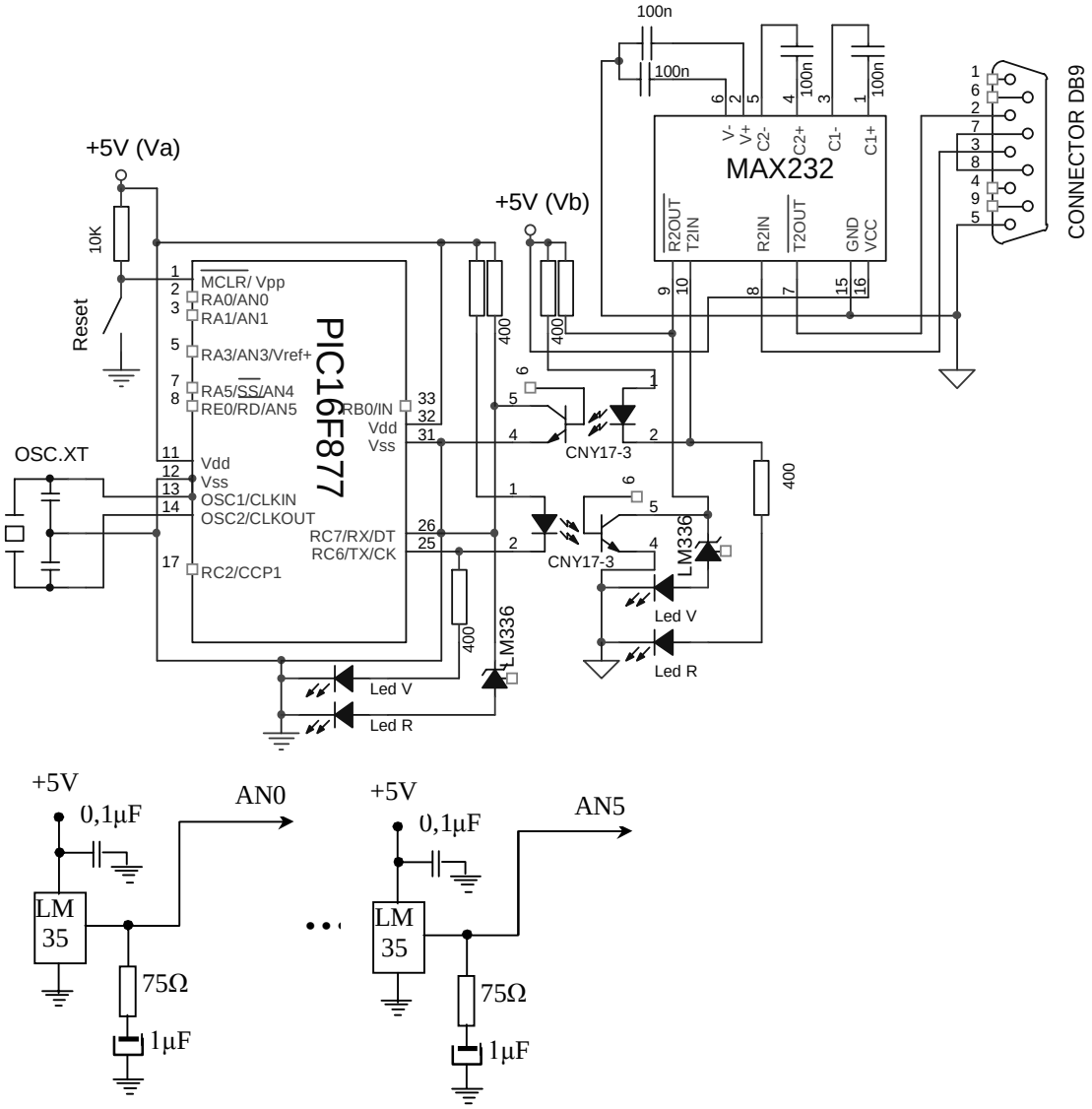

Fig. 2. The electronic signal acquisition diagram

The analog signals taken from the temperature sensors LM 35 type are applied to two of the microcontroller analog inputs which are converted via an analogue incorporeted digital converter.

All these signals are processed by the microcontroller through the program written in his memory.

The processed data are submitted by the serial to a computer that running a software purchase which serves to display signals in graphical form and the human operator using an interface can view the processed data and can intervene by setting certain parameters for alarm, etc.

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The serial module transmission of the data between the microcontroller and the computer circuit is provided with optocouplers for galvanic isolation so that a fault can occur in the purchasing system will not cause damage to computer systems and vice versa.

Tacking changes in temperature in the six chambers was achieved by using a virtual instrument with the programming environment LabWindows / CVI.

In figure 3 is shown the front panel control and visualization and it represents the interface between the purchasing system and human operator.

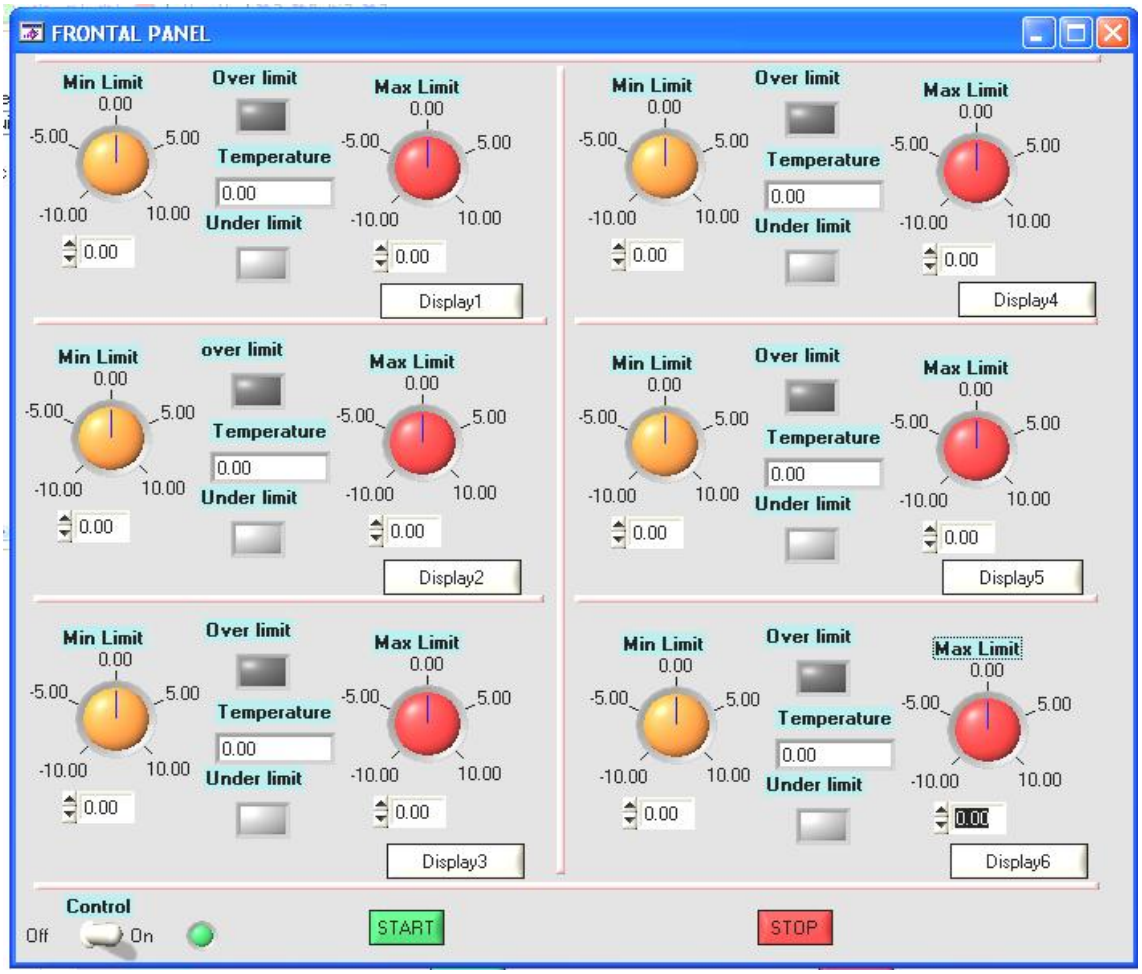

Fig. 3. The front panel control interface

The human operator can set via the interface certain temperature ranges represent the limits within which it wishes to maintain the temperature in each chamber.

The temperature control can mean, for example, design a control system working on a follow-up. The control system aims the temperature at a chamber and trying to maintain constant temperature in the second chamber. This system can be used to control an installation that introduces fresh air ventilation in a room. The control is achieved by modifying the reference to compensation for summer and winter to maintain the temperature difference between inside and outside to a level as low as possible.

CONCLUSIONS

The complexity of developing such a system does not stop here, it may be extended depending on the requirements and complexity of technological devices that must be managed. By simply removal in the external using connector of the microcontroller port, we can expand the applications that can be achieved through the platform and the possibilities, and not only, of serial communication such microcontrollers with a process computer or other such devices to be increasingly used in complex industrial applications, etc.

An important advantage of the application submitted is the discounted price of made and flexibility.

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