

## THE COMMAND AND MONITORING OF THE PARAMETERS U, I, n OF A DC MOTOR USING PIC MICROCONTROLLER

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ABSTRACT. In industrial applications (and not only), a very important role is played by microcontrollers which, more performant each day, gather a part of calculus technique necessary for control and acquisition, simplifying in this way the control devices for the technological processes they serve.

### УПРАВЛЕНИЕ И МОНИТОРИНГ НА ПАРАМЕТРИТЕ U, I, n НА ДВИГАТЕЛ С ПОСТОЯНЕН ТОК ЧРЕЗ ИЗПОЛЗВАНЕТО НА PIC МИКРОКОНТРОЛЕР

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РЕЗЮМЕ: Микроконтролерите играят важна роля в индустрията, а и не само. Всеки ден те събират данни, които са необходими за контрол и обработка, като по този начин опростяват контролните уреди за технологичните процеси, за които са предназначени.

### 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 monitoring parameters U, I and n for DC motor.

The voltage is taken directly from the motor terminals between 0V and 220V d.c. and applied adaptor modules and the current is taken through a resistor.

The block diagram used is shown in the figure 1.

For monitoring the D.C. motor turation we used the following scheme for coupling electronic proximity sensor to the microcontroller circuit.

The signals taken from adaptation modules are applied to two analog inputs pin of microcontroller and are converted by the internal analogic to digital converter.

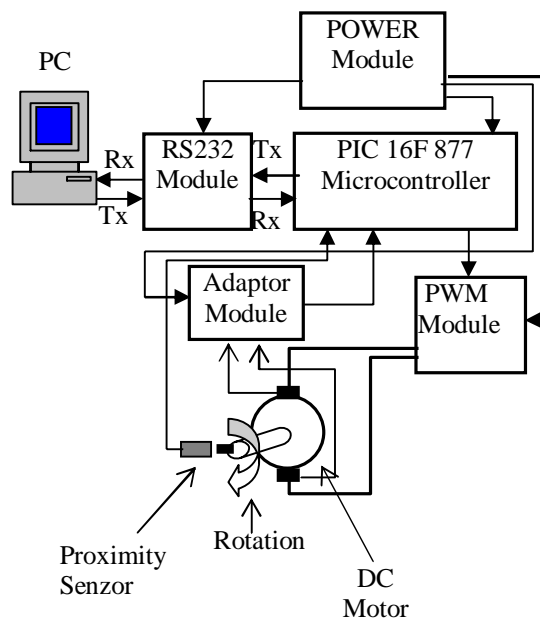


Fig. 1. Block diagram of data acquisition system

On the other hand, the signal as digital pulses over the proximity sensor is applied to a digital input pin of the microcontroller.

In figure 2 is present the electronic diagram connecting of the proximity sensor to a PIC 16 F877 microcontroller.

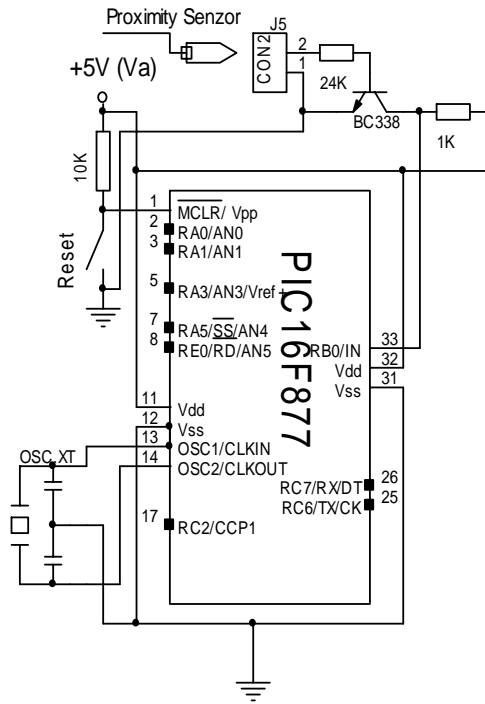


Fig. 2. Proximity sensor connection to the microcontroller

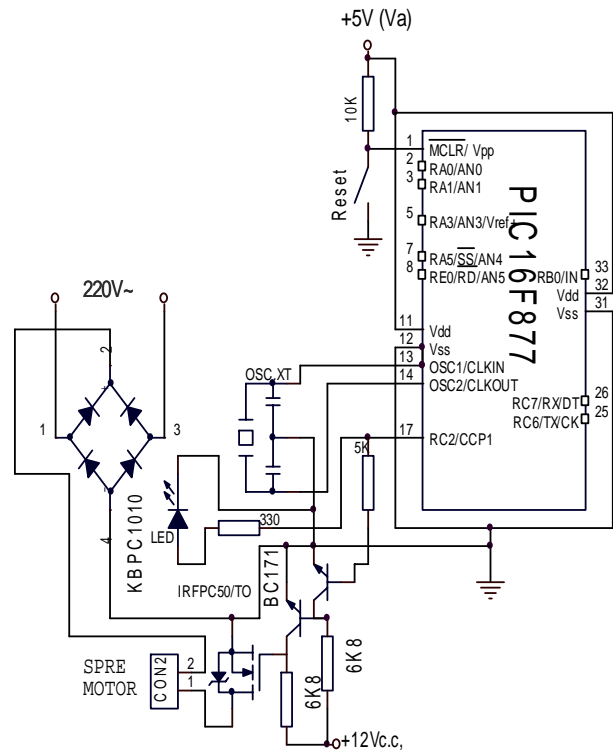


Fig. 3. The single-phase bridge rectifier

Taking the signals (voltage 0-5V) of process is made through a digital channel of the microcontroller, so to retrieve the signal from the motor shaft will use a capacitive proximity sensor type or a combination transmitter and receiver placed near a flange provided with a slot that is driven by motor shaft.

I used a capacitive proximity sensor that information provided by it is not influenced by external factors.

Capacitive proximity sensors are similar to inductive proximity sensors. The main difference between the two types is that capacitive proximity sensors produce an electrostatic field instead of an electromagnetic field.

Capacitive proximity switches will sense metal as well as nonmetallic materials such as paper, glass, liquids, and cloth. Standard targets are specified for each capacitive sensor. The

Dielectric Constant standard target is usually defined as metal and/or water.

Capacitive sensors depend on the dielectric constant of the target. The larger the dielectric number of a material the easier it is to detect.

These sensors will detect conductive material such as copper, aluminum, or conductive fluids, and nonconductive material such as glass, plastic, cloth, and paper. Shielded sensors can be flush mounted without adversely affecting their sensing characteristics. Care must be taken to ensure that this type of sensor is used in a dry environment. Liquid on the sensing surface could cause the sensor to operate.

For single-phase bridge (figure 3) rectifier requires a single control signal having frequency equal to frequency sinusoidal signal from the input rectifier. Reference signal (triangle) is much higher frequency than the sinusoidal.

Depending on the conduction times produced by the microcontroller, can vary the voltage rectified by a bridge rectifier power from zero to maximum, ranging Thus the induced voltage on the control of a DC motor can be control with very good accuracy, its speed.

All these signals are processed by the microcontroller through the program entered in the memory program of the microcontroller.

Data processed are serial transmission to a computer that running data acquisition software serves to graphical display signals and the human operator through the user interface can give commands to the D.C. motor changing its speed as a needed.

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The human operator commands are processed by software purchase as is transmits digital microcontroller wich is able to generate PWM signals by wich the D.C. motor speed is maintained at the desired value.

The proposed acquisition system can be extended to other applications by adapting the signals to the system requirements, by modifying the program written in memory of

the microcontroller program to the new arrangement and operator interface running on the computer.

Serial data transmission module between the circuit microcontroller and the computer is provided with optocouplers for galvanic isolation so that a fault can occur purchasing

system does not cause damage to computer system or data acquisition board.

In figure 4 is presented an electronic scheme of the data acquisition system formed around a core type PIC16F877 microcontroller.

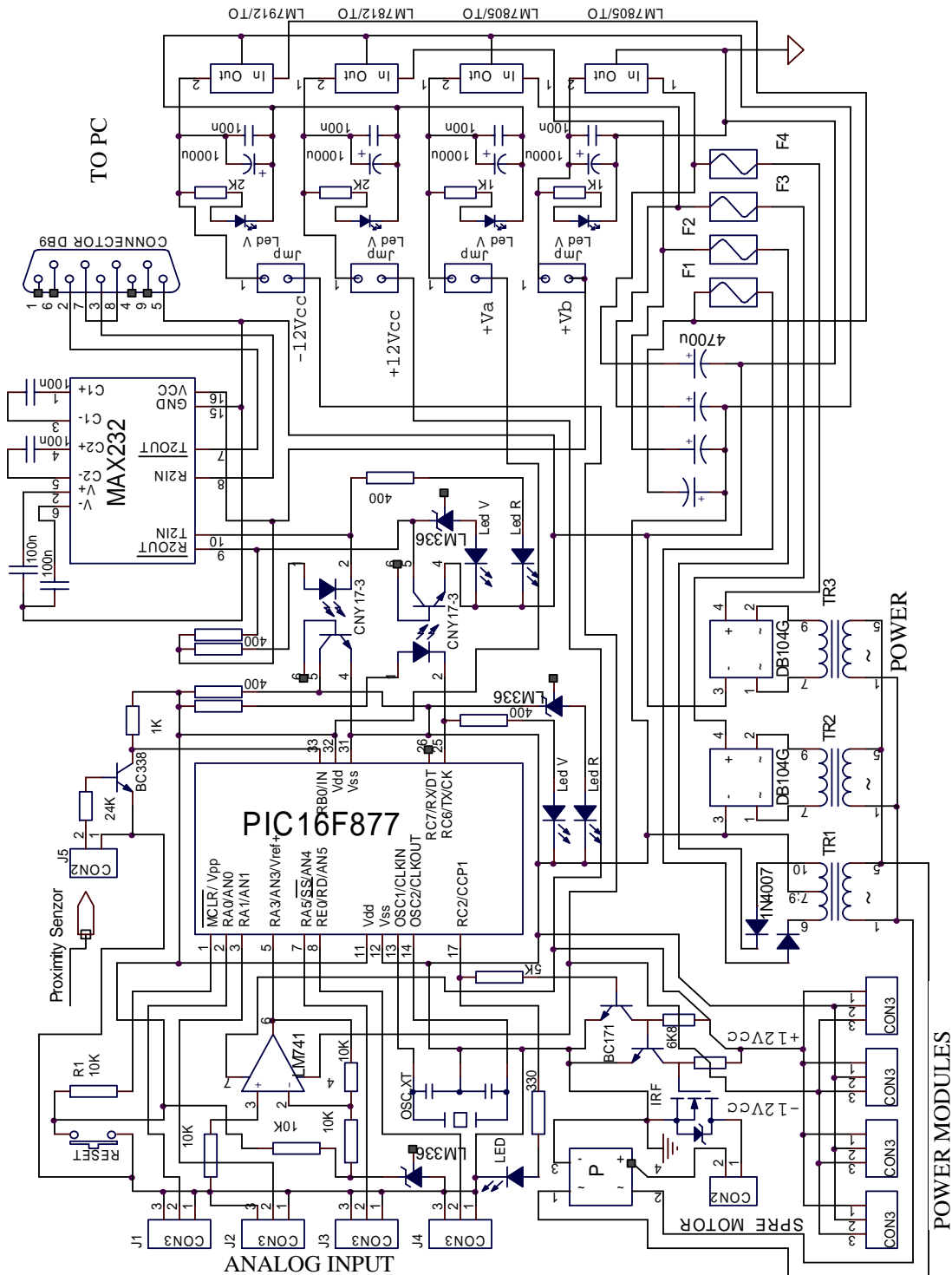


Fig. 4. The data acquisition system

## Conclusions

The complexity of this development system doesn't stop here. It can be extended function of the requirements and complexities of the technological installations which are to be controlled.

By simply removing of microcontroller ports in the external using connectors, also we may extend the applications which can be made with the help of the platform and due to the possibilities of a serial communication (and not only) with a process computer or with other devices of this type, makes

them more and more useful in very complex industrial applications.

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