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"TECHNOLOGIST" LOCAL CONTROL SYSTEM OF TECHNOLOGICAL PROCESSES

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Nowadays it is impossible to achieve faultless, fluent and efficient technological process without applying the advantages of information technology. Therefore control over the parameters of technological processes in all sectors of industry, calculation thereof through various mathematical methods on computers, formation of necessary effects on the analysis and course of the process and implementation of these effects in the scale of real time are one of the pressing problems of the day.

The choice of technical equipments, their software, communication mediums and their coordination is a different and enough voluminous work for various processes and technical equipments. Different personal computers and control and management systems (ADAM series of Advantech firm) of processes on the basis of data collection equipments have been created by a number of firms for the solution of these problems.

But we should mention that the systems created on the basis of personal or industrial computers give better effect mainly for the collected processes with parameters, but it is effectless for dispersed processes with parameters in many cases. To this end data collecting equipments were created and sorted for the type of parameters. This character results with waste during their usage. For removing this defect and simplifying the works it is proposed that the technical structure, equipment and basic programming system of the system should be sufficiently universal and identical for technological processes in all industrial sectors. System should be of open type i.e. should be available for connecting of any newly created equipment with interface to it and conduction of information exchange. In other words basic programming system should respond to standard protocols and interfaces. User software should be easily changeable and its coordination with basic programming system be enough simple. Taking into consideration the said requirements the scheme of the technical structure of local control system of technological processes is shown in figure 1. The control system is mainly consisted of computer set, interface converter, radio modifications and "operators" directly connected with technological processes:

- computer set gives the technologist of the technological process the opportunity of developing the process, controlling its parameters and in necessity intervening, printing the results and preparing for directing to high level;
- RS232/RS485 converter creates access from com port in computers to bus interface RS485;
- SST2450 radio modification creates access from RS485 interface to the communication with radio waves with 2,4 QHs frequency.
- Operator is consisted of mainly two types. These types differ for the number and exactness of analogue entries.

There is no limitation for the number of radio modifications put in the system. The number of each operator placed in RS485 backbone should not be more than 18. The length of RS485 backbone may be up to 1.2 km.

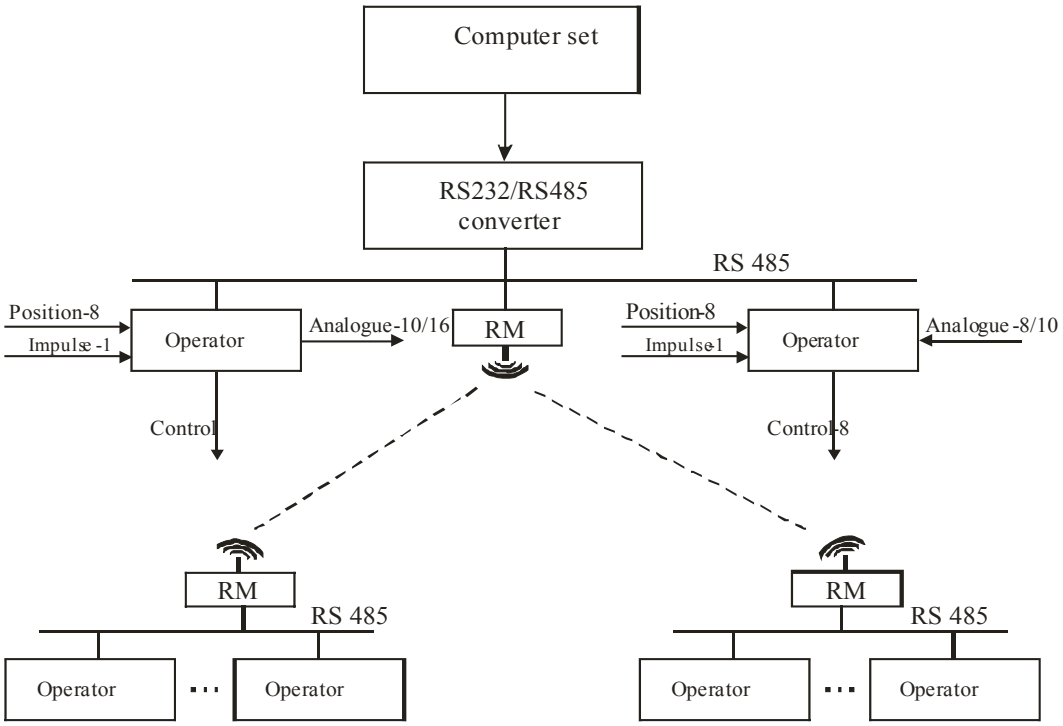

Figure 1. Technical structure scheme of local control system of technological processes

ROC protocol has been taken as the protocol of information exchange between the equipments of local control system of technological processes [1].

Commands and query sent from computer:

Destination (B)		Source (A)		Opcode	Data Length	m Data Bytes								CRC	
unit	group	unit	group		m	d1	d2	d3	-	-	-	-	dm	lsb	msb

Responds of computers:

Destination (A)		Source (B)		Opcode	Data length	n Data Bytes								CRC	
unit	group	unit	group		n	d1	d2	d3	-	-	-	-	dn	lsb	msb

Here : Destination (A) - - is the number of the asked or the commanded equipment.
Source (B) - - is the number of the asking or responding equipment.

Periodical threaded codes added for protecting data in the system from distortions had been calculated by multinominal CRC-16 (X^16+X^15+X^2+1) having power to protect 8192 bytes. If the data we transferred are multinominal G (x) it is possible to calculate CRC -16 as R (x) in G (x)= P (x)* (X^16+X^15+X^2+1) +R (x).

If the data are collected in the line s and result is kept in result alternation of word type the following StringCRC function may calculate CRC-16 by ByteCRC low program.

```
Procedure ByteCRC (data:byte; var CRC: word);
VAR i: BYTE;
BEGIN
FOR i:=0 TO 7 DO
BEGIN
IF ((data and $01)XOR(crc AND $0001)<>0) THEN
BEGIN
crc:=crc shr 1;
crc:= crc XOR $A001;
END
ELSE crc:=crc shr 1;
data:=data shr 1;
END;
END;

function StringCrc(s:shortstring):word;
var len,i:integer;          // CRC-16 by this algorithm
begin                      //
 result:=0;                 // G(x)=P(x)* (X^16+X^15+X^2+1) + R(x)
 len:=length(s);            //
 for i:=1 to len do         //  Is found as R (x) in the equality
 bytecrc(ord(s[i]),result);
end;
```

Operator is mainly consisted of the following modules:
- power module of the equipment (POWER);
- module normalizing analogue signals (ASN-8);
- module strengthening control signals (SM-8) ;
- visual control module over control signals (LED-8) ;
- basic collecting controller module (AİADİO-888).

Power module of the equipment is consisted of alternating voltage transformer (220 VAC/12VAC) or direct adapter voltage (220 VAC/12VAC).

Module normalizing analogue signals turns standard current signals used in industry (0-5 Ma, 1-20 Ma and etc.) into voltage signals and protects AIADIO-888 module from logging out.

Module strengthening control signals gives opportunity to direct controlling of actuating mechanisms fed by net voltage (220 V AC or 380 V AC) used in industry.

Visual control module over control signals creates the opportunity of actuation command.

Basic collecting controller module AIADIO-888 controls, analyses the analogue condition connected to it and controls request signals via computer and sends to computer by RS-485 interface. Having analyzed these results in a computer decisions are formed regarding the control of this process. Any accepted command is executed by being transferred in opposite direction towards AIADIO-888 modulus.

AIADIO-888 modulus as the main size, control, calculation, management and communication center of equipment has been created in the base of ATMEGA 32 microprocessor of AVR Technology and RISC structure.

Literature

1. ROC Protocol User Manual. June 2007.