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WIRELESS SYSTEM OF WORKING ACHIEVEMENT CONTROL AND PRODUCTS IN PRODUCTION OPERATION

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ABSTRACT
The goal of the article is focused on wireless system prototype development for working achievement control and calculation of final products. Theoretical part explains radio techniques principle and represents number of high-frequency hybrid modules for wireless data transmission based on free industry tapes 434 and 868 MHz. Furthermore the contribution deals with micro-controllers PIC Microship, with circuits PIC16F627A and PIC16F73 in the concrete. Practical part of the work describes step by step the whole development and construction of the equipment. Starting with the components choice, following by the lay-out of the scheme connection, micro-controllers programming and finally the production, revitalization and system testing.
Keywords: wireless system, transceiver, receiver

1. INTRODUCTION
The interest of each factory is maximum working achievement. There is effort to produce maximum number of goods, maximum effectiveness and more economical of manufacturing.
This article describes development and construction of the equipment for control of the working achievement in AVON Automotive company, subsidiary company of the british corporation AVON Robber p.l.c. - Wiltshire. The designed equipment is implemented in a real shopfloor where workers form the rubber tubes into required shape. The wireless system is used for accounting of manufactured goods, the mobility of the system was requirement of british corporation AVON Robber p.l.c. The design system is connected to company database ORACLE which is used for control of the working achievement.

2. SYTEM REQUIREMENTS
The wireless system is designed for control of the working achievement of several tens workers. The principle of data reading from shopfloor is very easy, every worker has to record a fabricated hose by the help of a push button. The workers push the button in the time when they put the final product into a box. The buttons are equipped with an electronic counter with LCD display, the counter circuit is mobile. A reset of the counter is executed by the help of special button. The data from counter are transferred to a central computer by the wireless system. The system requirements are as follows:

- mobility of the counter with LCD display
- identification of the counters according to ID code
- push - button switch contains
  - alarm LED
  - interface for LCD counter
  - connectors for future expansion
- receiver contains
  - communications interface
  - clock and date

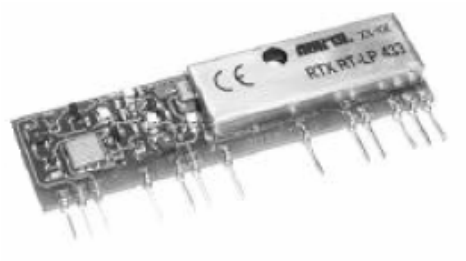
- o reserved battery and circuit for charge
- o memory
- o ID code of the push – button

3. DESIGN OF THE WIRELESS SYSTEM

3.1. Design of the wireless push - button

The electronic of the push – button module should be simplest and cheap because the wireless system contains more push – button modules. A purpose of the module is to evaluate pressing of the button. A value displayed on LCD must correspond to actual number of pressing, same value must be saved in database ORACLE.

Figure 1. The digital counter



Figur. 2. AUREL RTX-RTLP 434

3.2. Radio module for wireless communication

For wireless communication between the push – button module and a receiver was used RF hybrid module that works in a free industrial zone 433,92MHz. The RF hybrid module supports dual communication and includes a receiver and a transceiver. Because working reach of the wireless system in shopfloor is 50m the performance of the module must be +10dBm and system sensibility should be -90dBm. The transceiver RTX-RTLP-434 was used in designed system (Fig. 2.). The technical parameters of the transceiver are presented in Tab. 1.
The wireless module is equipped with a flexible antenna.

Table 1. Technical parameters of the transceiver AUREL RTX-RTLP 434

	Min	Typical	Max	Unity
Working centre frequency		433.92		MHz
Voltage supply Vs	2.8	3	3.2	V
Absorbed current [TX ON]	15		17	mA
Absorbed current [RX ON]	0.07	0.08	0.09	mA
RF sensitivity		-95		dBm
RF passband at –3dB		600		KHz
Output square wave		2.5		KHz
TX Power		10		dBm
Antenna impedance		50		Ω
Switch-on time			1	s
TX-RX commutation time			500	ms
Working temperature	-20		+80	°C
Dimensions	63.3 x 17.2 x 5 mm			

Figure 3. Spherical antenna for 433,92MHz

3.3. Microcomputer

A single-chip microcomputer was used for control of the process. In the concrete a type PIC 16F627A was used in the push – button module and a type PIC16F73 in the receiver. The circuits with 8-bite structure and memory FLASH with minimum size 1 Kbyte was preferred.

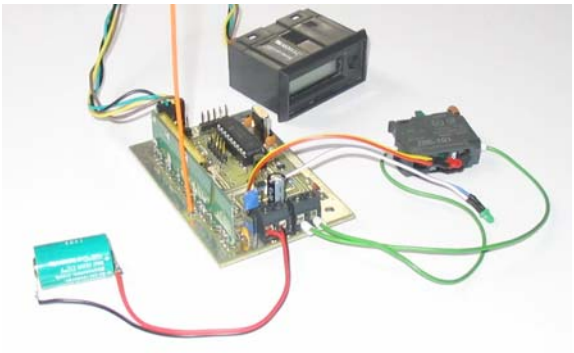


Figure 4.The push – button module

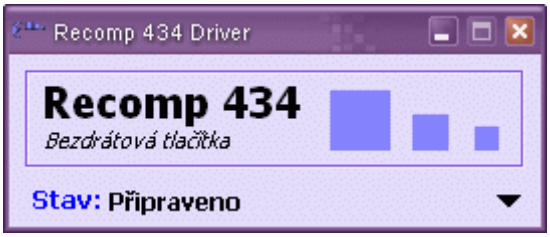


Figure 5. The status panel of the downloader

4. SOFTWARE

4.1. Firmware for the receiver and the push – button module

An assembler as a programming language was used for creation of the firmware. Both designed programs are written by the help of program background MPLAB IDE v.7.10 - Microchip.

4.2. Downloader for PC

The program „Recomp 434 Driver“ was written in order to transfer of date from the receiver to PC. This program controls SRAM memory and was realised by the help of Delphi 2005 for Windows.

5. SYSTEM IMPLEMENTATION IN PRODUCTION PLANT

The parameters of the push – button module and the parameters of the receiver are shown in Tab. 2 and Tab. 3. A reach of the radio signal in mentioned system is 100m in free space. The designed system was implemented for working achievement control in the british corporation AVON Robber p.l.c. The examples of implementation in plant are shown in Fig.6 – 7.

Figure 6. Workstation with the receiver

Figure 7. The workplace with the push – button module

Figure 7 The final push – button module

Table 2. Technical parameters of the push – button module

Parameter	MIN	TYP	MAX	Unit
Supply voltage	2,8	3	3,2	V
Current comsumption inactive	170			μA
Current comsumption in operation	8	11	17	mA
RF discharge		10		dBm
System sensibility		-94		dBm
Frequency		433,92		MHz

Table. 3. Technical parameters of the receiver

Parametr	MIN	TYP	MAX	Unit
Supply voltage	9	12	18	V
Current comsumption – external source		22	200	mA
Current comsumption – reserve baterry		10	26	mA
Capacity of reserve baterry		2200		mAh
RF discharge		10		dBm
System sensibility		-94		dBm
Frequency		433,92		MHz
Memory capacity		7999		records

6. ACKNOWLEDGEMENTS

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