PSPICE Simulations of Pulse Distributor in Industry

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***Abstract* – The pulse distributor is realized on three integral timers. It generates square pulses shifted in time. By using PSPICE software, a simulation of the operation of the distributor has been done, as well as an adjustment of the time-setting elements and the parameters of the pulse packet. The pulse distributor has been designed to be used in industry.**

***Keywords* – PSPICE Simulations, Pulse Distributor.**

I. INTRODUCTION

Are proposed scheme of distribution of pulses developed on the basis of the timer 555 and converter angle into digital code and pulse duration on the basis of a timer 555, which is managed by a single – chip microcontroller PIC18F252.

Simulations are made of schemes of work with the software PSPICE.

II. ALLOCATOR PULSE TIMER 555

Scheme distributor pulses is shown in Fig. 1. It's based on three timer which are connected in series. The first timer is started using a brief pulse low, which made its finding 2. He made pulse duration 105 μs. The end of this second pulse starts a timer which produce pulse duration 105 μs. The end of the second pulse timer starts timer third, who also produced pulse of 105 μs. The duration of each pulse timer is determined by time constant of the chains time determine timers R1-C1; R3-C4; R5-C7. Thus the outcome of each timer can be obtained dephasig sequences of pulses with different duty cycle.

In Fig. 2 and Fig. 3 shows the timing diagram of operation of the scheme in the period of the clock pulses 750 μs and 1500 μs.

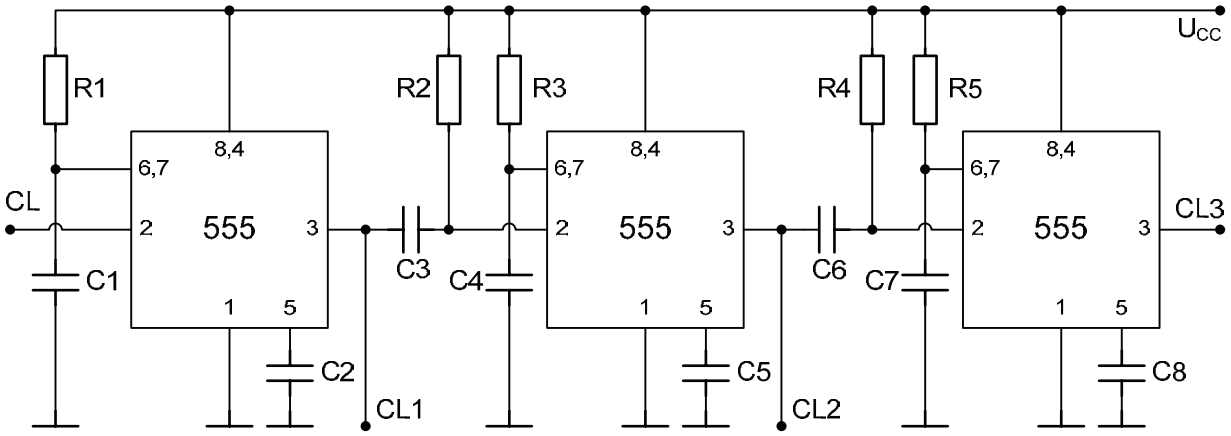

Fig. 1

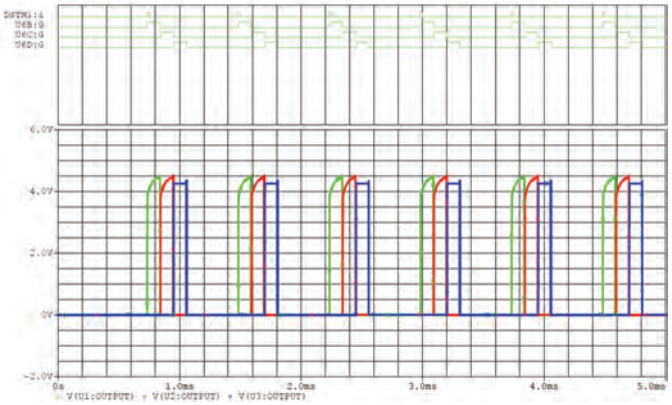

Fig. 2

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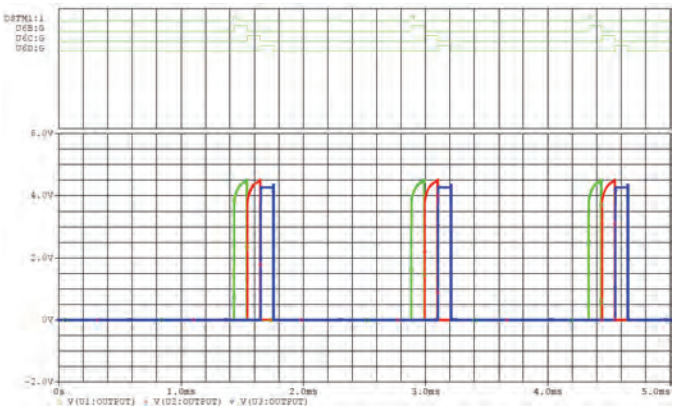

Fig. 3

III. CONVERTER ANGLE OF ROTATION IN A NUMERIC CODE AND PULSE DURATION

The scheme of the converter is shown in Fig. 4. Converter is developed based on single – chip microcontroller PIC18F252 and timer 555. For visualization of the information used two line alphanumeric LCD displays. Table I gives the characteristics of the chosen microcontroller.

TABLE I

Program memory capacity	32 K
Available I / O ports	PORT A, B, C
RAM memory capacity	1536
Number of sources of interruption	17
Number of channels of analog-digital converter	5
Body/Casing/	28 pin DIP
EEPROM memory capacity	256
Timers	4
Maximum clock frequency	40 MHz
CCP modules	2
Modules in series communication	MSSP, USART
Number of instructions	75

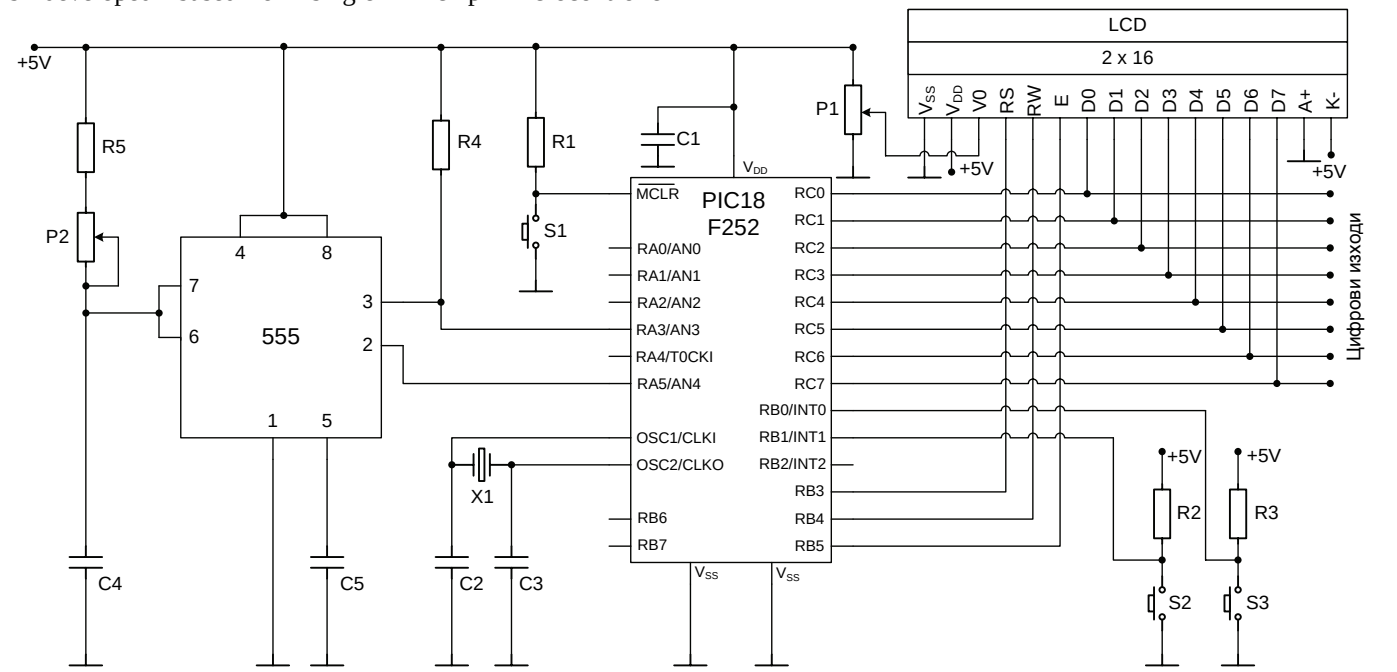

Fig. 4

Timer 555 operates as a waiting multivibrator. Allowing low-level pulse is applied to the conclusion of the microcontroller 2 of the timer. Authorizing pulse is less than pulse duration, the timer generates. Therefore, each authorization timer generates a single pulse output 3. At the same time and start timer 1, which is one of four built-in timer of the microcontroller. The duration of the output pulse depends on time constant of the time determine chain which is made up of elements R5, P2 and C4. Time constant altered by changing the resistance in time determine circuit by the potentiometer P2.

This regulates the duration and rate of filling

the output pulses. The period of these pulses is fixed by the microcontroller and 10 ms (100 Hz). The duration of each output pulse is measured by timer 1. As a clock stroke signal for timer 1 is used $f_{OSC}/ 4$, which is f_{OSC} clock stroke frequency of the quartz oscillator of the microcontroller - 10MHz. Timer 1 counting pulses during the duration of the output pulse of timer 555. Thus, the Timer 1 registers will have a numeric value that is proportional to the duration of the pulse output of timer 555. This value can be derived from the digital outputs of the microcontroller in binary form or can be displayed on the LCD alphanumeric display.

Thus, microprocessor system can convert the angle of rotation of the potentiometer P2 in numeric.

In Fig. 5 and Fig. 6 are given the signal timing diagram of output 3 timers 555 at two different positions of rotation of the potentiometer P2.

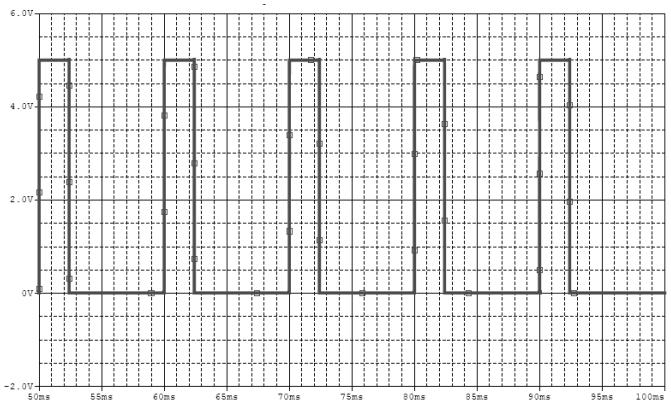

Fig. 5

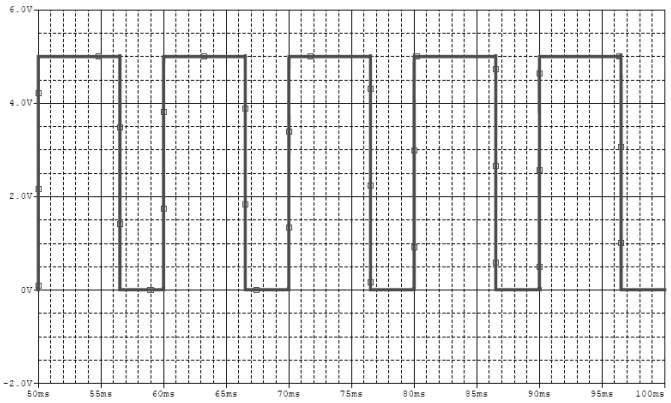

Fig. 6

In the Table II are given a pulse duration of the source and the coefficient of filling for various values of the resistance of the potentiometer P2.

TABLE II

Resistance, kΩ	t, ms	t/T, %
0	0.755	7.55
5	1.130	11.30
10	1.505	15.05
15	1.880	18.80
20	2.254	22.54
25	2.628	26.28
30	3.002	30.02
35	3.374	33.74
40	3.750	37.50
45	4.125	41.25
50	4.496	44.96
55	4.871	48.71
60	5.245	52.45
65	5.618	56.18
70	5.990	59.90
75	6.364	63.64
80	6.737	67.37
85	7.111	71.11
90	7.489	74.89
95	7.862	78.62
100	8.231	82.31
105	8.611	86.11
110	8.983	89.83

A. Depending on the duration of the pulse function in the resistance of potentiometer

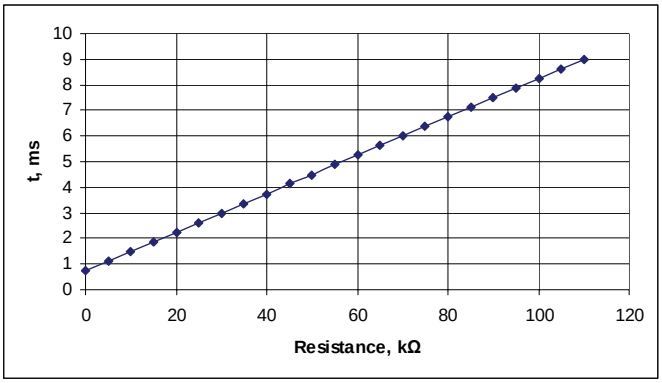

Fig. 7

B. Depending on pulse duty factor in the function of the potentiometer resistance

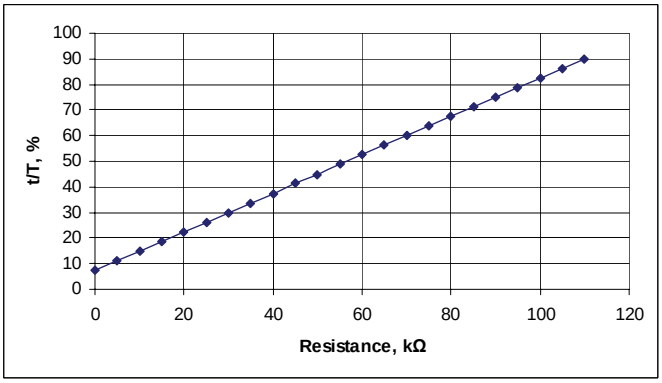

Fig. 8

Advantages of the converter of Fig. 4:

1. Converts an angle in the pulse duration of high linearity;
2. Pulse can be measured with very high accuracy, because clock frequency of Timer 1 (2.5 MHz) is much greater than the frequency of pulses generated by timer 555 (100 Hz);
3. Information from the angle of rotation can be displayed on LCD display or transmit parallel code as a digital device to another.

IV. CONCLUSION

The proposed schemes are developed and tested with the software PSPICE. The developed converter angle into digital code and pulse duration can be used in many areas of pulse and digital equipment such as a generator of pulses with constant period and variable duty cycle or as a digital potentiometer. Developed a program in assemble language by which the microprocessor system can convert the angle into a digital code or ASCII code which is suitable for displaying information on alphanumeric displays.

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