РАЗДЕЛ XXV. ЭЛЕКТРОНИКА

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Identification device circuit

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Abstract

This article deals with the description of the developed identification device circuit based on logical devices. The circuit under consideration can find its application in large warehouses to facilitate the task of finding the right products.

Keywords: encoder, decoder, the Proteus design suite, computer-aided design of electronic circuits, identification device.

Аннотация

Данная статья посвящена описанию разработанной схемы устройства идентификации на базе логических устройств. Разработанная схема устройства идентификации может найти своё применение на складах большой площади, для облегчения задачи поиска нужной продукции.

Ключевые слова: шифратор, дешифратор, программа для автоматизированного проектирования электронных схем Proteus, устройство идентификации.

Introduction

There is often a task of searching for a certain shelf of the rack in the warehouse. To facilitate this task the staff is encouraged to use an intuitive identification device.

The developed identification device circuit contains a keyboard and keys with the description of the products on a certain shelf of the rack. When you press the key, a screen displays a certain number of the rack shelf with the products the storekeeper needs.

Encoder and decoder operation principle

An encoder is a device that converts decimal numbers (positional or unitary code) into a binary code. The encoder has m inputs numbered with decimal numbers (0, 1, 2... ($m - 1$)) and n outputs, with $2^n > m$. The supply of a control signal to one of the inputs leads to the appearance of an n -bit binary number at the output corresponding to the number of the excited input. Figure 1 shows the conditional graphic designation. The encoder truth table is presented in Table 1.

Figure 1. Conditional graphic designation of the encoder

Table 1

The truth table of the encoder

N	Input signals										Output code			
	x_0	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	y_8	y_4	y_2	y_1
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	1
2	0	0	1	0	0	0	0	0	0	0	0	0	1	0
3	0	0	0	1	0	0	0	0	0	0	0	0	1	1
4	0	0	0	0	1	0	0	0	0	0	0	1	0	0
5	0	0	0	0	0	1	0	0	0	0	0	1	0	1
6	0	0	0	0	0	0	1	0	0	0	0	1	1	0
7	0	0	0	0	0	0	0	1	0	0	0	1	1	1
8	0	0	0	0	0	0	0	0	1	0	1	0	0	0
9	0	0	0	0	0	0	0	0	0	1	1	0	0	1

Encoders are widely used in automation devices, especially in information input/output devices.

A decoder is a converter of an n -bit binary code into a unitary code "1 of m ", where $m = 2^n$. Each code combination at the decoder inputs corresponds to an active level at only one of the outputs. The conditional graphic designation of the full decoder for four inputs ($n = 4$) is shown in Figure 2, the decoder truth table is presented in Table 2.

Figure 2. Conditional graphic designation of the decoder

Table 2

The truth table of the decoder

Input signals				Output code									
y_8	y_4	y_2	y_1	x_0	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	0	0	1	0	1	0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0	0	0	0	0	0	0
0	0	1	1	0	0	0	1	0	0	0	0	0	0
0	1	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	1	0	0	0	0	0	1	0	0	0	0
0	1	1	0	0	0	0	0	0	0	1	0	0	0
0	1	1	1	0	0	0	0	0	0	0	1	0	0
1	0	0	0	0	0	0	0	0	0	0	0	1	0
1	0	0	1	0	0	0	0	0	0	0	0	0	1

Description of the developed identification device circuit

The developed circuit identifies the keystroke on the keyboard containing 99 keys. In addition to the keyboard, the developed identification device circuit contains 99 resistors, 59 diodes, 11 encoders "10 - 4", a decoder "4 - 10", 2 seven-segment indicators and 10 four-input "OR" logic

elements. The developed identification circuit was assembled and modeled in the program for computer-aided design of electronic circuits Proteus.

Pressing the button, its number appears on the seven-segment indicators. If several buttons are pressed simultaneously, the seven-segment indicators will show the number of the button that was pressed first. The device will not respond to the other buttons. If you release the button that was pressed first, the number of the larger pressed button will appear on the seven-segment indicators.

The circuit operation principle shown in Figure 3

When one of the buttons (position 1) is pressed, a signal is received at the input of the encoder (position 2) this button is connected to. A binary signal is generated at the output of the encoder that is fed to the diodes (position 3) preventing the inputs of the encoders from short circuit (position 2). Then it goes to the seven-segment indicator (position 4) that shows the value of the "units" of the number of the pressed button.

The encoders signal (position 2) goes to the "OR" elements and diodes (position 5). Then it reaches the encoder (position 6). The signal from the output of the encoder (position 6) goes to the seven-segment indicator (position 7) that indicates the value of the digit "ten" of the number of the pressed button.

Figure 3. Diagram of the identification device with positional designations

Figure 4. Check of the identification device circuit efficiency when Button 21 is pressed in Proteus – the program for computer-aided design of electronic circuits.

Conclusion

This article describes the operation principle of the developed identification device circuit that was assembled and modeled by means of Proteus – the program for computer-aided design of electronic circuits, thereby checking its operability.

This circuit can be modified by improving its functionality to 999 keys and displaying a three-digit value on the screen.

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