# VOLTÍK II.

# Guide for construction kit

Guidelines for construction
of 50 electronic models
from a honker to a radio

# Safety

This symbol on the product means that used electrical product must not be disposed of with household waste. To ensure proper disposal of the product hand it in at the designated collection points, where it will be accepted free of charge. By disposing of this product you will help save valuable natural resources and prevent potential negative effects on the environment and human health, which could otherwise arise from inappropriate waste handling. For more details, please contact your local authorities or the nearest collection point. The improper disposal of this type of waste may fall subject to national regulations for fines.

**Principles for the safe handling of batteries:**

- Use only the recommended type of batteries.
- Insert the batteries in the correct polarity.
- Do not mix rechargeable and normal batteries.
- Do not use new and used batteries together.
- Do not recharge batteries that are not intended for charging!
- Remove dead batteries from the toy and hand over for recycling.
- Batteries must only be charged under the supervision of an adult
- Batteries must be removed before charging from the toy.
- The power terminals must not be short-circuited.
- This information should be retained for future reference!

# Introduction

After the favorable acceptance of our electronic construction kit VOLTÍK I designed especially for children with no experience with electronics, we bring you a construction kit VOLTÍK II. - Electronic laboratory, which will open wide the doors to the colorful world of hobby - electronics, some principles which you will learn with this kit, are also used in industry. The kit contains the working panel on which are soldered on the back of the sockets the electronic components, interconnecting electrical wires and rubber plugs for wires fastening. Sockets (and thus the electronic components) are connected using electrical wires according to the instructions in this guide, then the result is always one of the 50 models with a variety of features. For example you can build 4 different sirens, alarm responsive to light, sensitive noise detector and "color music", non-contact metal detector, electronic metronome, field telephone, electronic device for "Head-Tails" or even a crystal or simple AM radio. For model no. 51 - "Something extra" kit contains everything you need for making your own source of electricity from a lemon and use it to light the light emitter in your kit. Kits enables you to build different variant of the circuits or a completely new electronic circuit boards. To create entirely new schemes you will need some experience and theoretical knowledge that this guide does not contain and which must be obtained in the literature. VOLTIK II. is designed as VOLTIK I., for a broad range of children, including those that have little to no experience with electronics. It contains wiring diagrams of the exact procedure of wiring of mechanical. VOLTIK II. requires greater accuracy of wiring, since the schemes are, in contrast to VOLTIK I., complex and error in wiring can cause damage to some of the semiconductor devices. Components used in the kit are easy to come by in every major city, so it can be easily replaced. List of components is at the page XX. If you want some models to construct permanently as a standalone device, it is possible to buy components according to the wiring diagram and solder these to the universal printed circuit board. If you have no experience with soldering, you will certainly find someone in your area, who will consult with soldering or borrow a book for young radio fans.

For your satisfaction, please accept a few principles that reduce the risk of disappointment from the failing model or destroyed components:

**- Put 4 AA batteries (R6-AA-1.5V) in the right direction** to the housing on the side of the working panel according to Fig. 1

**- Do not use differently discharged batteries.**

**-Attach the stripped wire ends into the sockets as shown in Fig. 2** using the rubber pins so as to be in reliable contact. Only then can electric current go through and models can not function properly. If the wire only lightly touches the socket and is not properly secured with a rubber plug, while current can flow, but this poor connection acts as an unwanted electric resistance, which can in some models affect their performance.

**-Work according to "Wiring guides".** These are made so the circuit can be constructed systematically and with minimal risk of wrong or omitted connection. Some more complex schemes (particularly with amplifier) would not work correctly even when right, but connedted in wrong order.

**- Insert the batteries into the case only after checking of wiring.** When connecting the circuit you just need to pull out of the housing only ona battery - power is interrupted to the sockets 1 and 2 and during the wiring, when the wires on the panel can touch the sockets without a risk that a component could be accidentally destroyed. Always check the wiring and the quality of the wires in the terminal (whether loose or tucked in too deep - see Fig.1D) before inserting the battery. For more complex models perform even the recommended partial checks after the partial construction of the model ("Check Connections"), which significantly reduces the risk of error in the overall connection.

**- Unplug malfunctioning model from power supply**. A model that does not work as directed, indicated a mistake in wiring and also the likely possibility that some component is electrically overloaded. Shut off power supply immediatelly by taking out the battery from the case on the side panel or switching the slide switch down (when the model involved has a switch) and try to detect and remove the error. We recommend to check the quality of wiring on all sockets and tighten the loose wires. If model still doesn't work, check connections according to "Wiring guide". If there are more errors in wiring, it is faster and more reliable to remove all wires from model and wire them again.

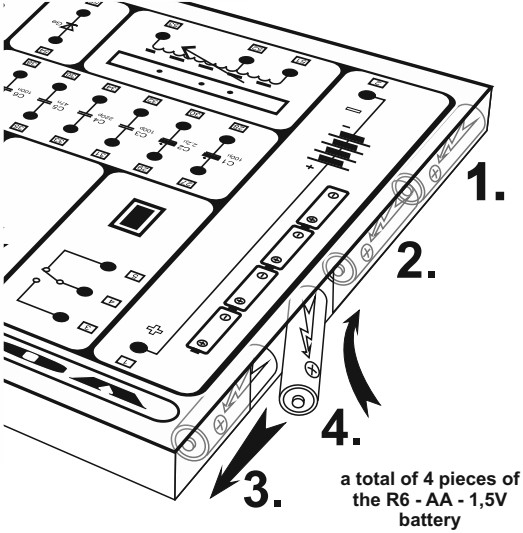



fig. 1 Inserting the batteries

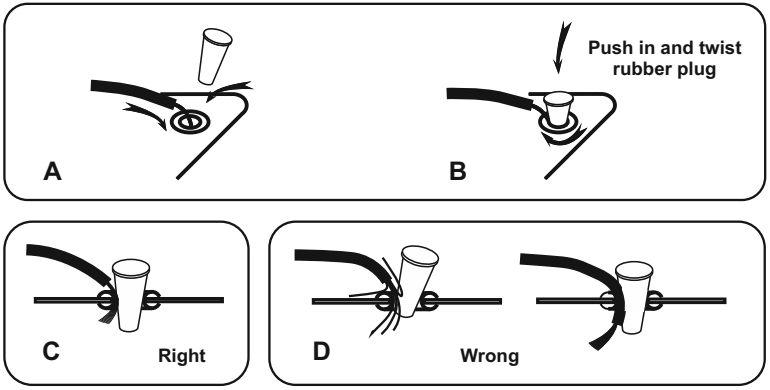



fig. 2: Fixing of conductors in contact sockets

# Wiring guides

**- Conductors:**

VOLTÍK II. includes 49 pcs of connection wires in these numbers and lengths: 15 pcs -5 cm, 20 pcs -12,5 cm, 10 pcs -25 cm and 4 pcs -100 cm.

Cable lengthts is in this text indicated by number of dashes, 5 cm long conductors (size no.1) are designated "-", 12,5 cm long conductors (size no.2) has symbol "- -", 25 cm long conductors (size no.3) are designated "- - -"and 100 cm long conductors (size no.4) are designated "- - - -" According to EXAMPLE (at this page on the right side) you need 1 wire no.1, 1 wire no.2 and 2 wires no.3 (conductor no.4 is not used in this model). -

**Wiring guide:**

is a list of connections, to be carried out by electric wire between the sockets on the work panel so that model would work according to instructions. In our example, therefore, take one wire no.1 and connect one of the stripped ends to the socket no.1 on the work panel using rubber plug (shown in Fig. 1) and attach the other end in the same way into the socket no.4. Next, attach the wire no.3 to sockets 3 and 19, then wire no.2 to sockets 20 and 45 and finally wire no.3 ti sockets 46 and 2. When connecting, follow lines of "Wiring guide" top to bottom. Great is sliding for example a piece of paper and covering wiring still not done, so you don't forget anything.

That's all you need to know, and now you can start work. Have fun!.

EXAMPLE

**Wires:**

1 pc -
1 pc - -
2 pcs - - -

**Wiring guide:**

1 - 4
3 - - - 19
20 - - 45
46 - - - 2

**WARNING!!!**

**NEVER CONNECT VOLTÍK TO WALL SOCKET OR ANY OTHER ELECTRICAL DEVICE !!!**
**YOU CAN INJURE YOURSELF (EVEN DEADLY) AND CAUSE EXTENSIVE DAMAGE !!!**

# VOLTÍK II.

## MODELS

# 1. Electrical circuit with button, resistor and light

Let's begin with the simplest. Circuit in accordance with the circuit diagram in Fig. 1.1 contains the power supply (battery, AA batteries, 4), appliance - light emitting diode (LED), a resistor that limits the current through the LED diode, switch button and connecting wires. Connect the sockets on the panel as indicated or according the "Wiring guide", insert the battery into the enclosure on the side panel of Voltik and after pressing the button light will start to shine. By pressing the button contacts touch and closes the electrical circuit. Electric current flows after button press from the plus (+) terminal of the battery through the connected components to minus (-) terminal of the battery. LED diode is connected in the forward direction, so it conducts current, and lights up. After releasing the button, the circuit is interrupted, the current ceases to pass through, and LED goes off.

Now try to connect the light reversely (swap each wire ends mounted in sockets 21 and 22). The diode is now connected in the reverse direction, does not pass current, and thus does not light after pressing of button. You have confirmed the fundamental function of semiconductor diodes -lets current flow in only one direction. Using this simple connection you can whenever you are in doubt confirm whether the individual light is fine. In the diagram is connected yellow LED but by switching the ends of the wires from the sockets 21 and 22 into the sockets 19 and 20, where 23 and 24 can light up red or green LED. **WARNING!** It is necessary that the LED diode circuit always includes limiting resistor. If you connect the LED diode in the forward direction directly to the power supply - the battery, surely it will be destroyed.

**Wires**
1pc -
3pcs - - -

**Wiring guide:**

1 - - - 9
10 - 45
46 - - -21
22 - - - 2

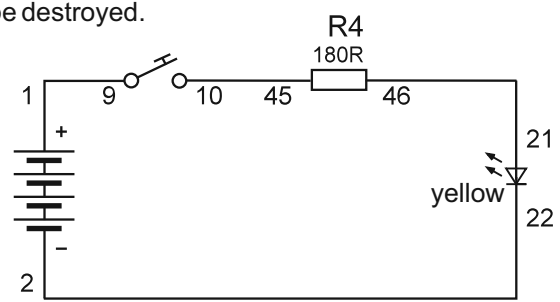



fig.1.1

# 2. Electrical circuit with light intensity switch

On this circuit you can try the electric resistance in the circuit. After connecting the circuit diagram from Fig. 2.1 and insertion of the battery yellow LED lights. You can change the brightness using switch.

Switch passes a current to light through a resistor either 180Ω (Ω-OHM - the unit of electrical resistance) in the upper position of switch or via a resistor 560Ω (switch in the down position). If resistance has greater value - 560Ω brightness is weaker because, the current passing through it is smaller than with resistance 180Ω. Replace the resistance R6 - 560Ω by switching of cable connections to adjacent resistor on the panel R5 - 8,2k Ω (8200 Ω), which has almost 15 times bigger value. Light is now very weak, because the current flowing through it is much smaller. (On the Voltik panel you find two more resistors - 100k - 100000 Ω and 1M0 - 1 million Ω)

Electrical resistance properties that you confirmed are described by so called Ohm's law - the relationship between electric voltage, resistance R and current I flowing through the resistor. We commit to falsity in order to facilitate understanding and light resistance can be ignored. Then the current flowing through your circuit is computed using the following formula:

$$I = \frac{U}{R}$$

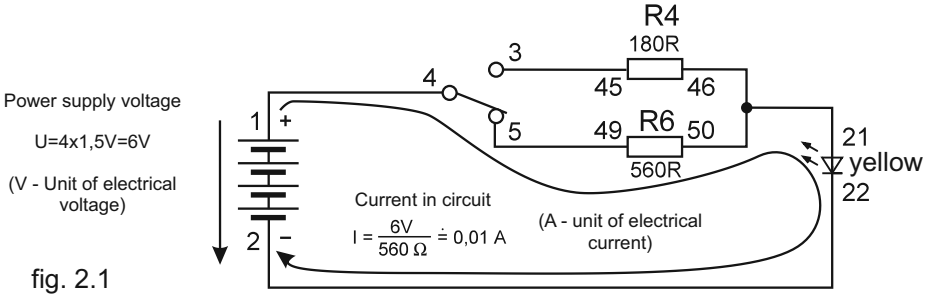



fig. 2.1

**Wires:**
2pcs -
1pc - -
3pcs - - -

**Wiring guide:**

1 - 4
3 - - - 45
5 - - - 49
46 - 50
50 - - 21
22 - - - 2

# 3. Electrical circuit with button and switch in serial connection

The circuit that you construct according to figure 3.1, allows you to understand the principle of the serial connection of switches. Circuit is also model of also called logical function "AND". After connecting according to diagram or "wiring guide" insert the battery and switch up to "ON" position and press button - light turns on. When you release the LED goes off. When you push the switch down to the "OFF" by pressing the button the light does not start to shine. It follows that when the light in serial wiring switches only, when both button and switch are ON. Logic function generally expresses the relationship between the input variables - in this case the switch status (on or off) and output variable - in this connection is that the brightness of the LED diode. The logical functions are tabulated. Our involvement assign states when the button or switch is ON, marking LOG 1 (logical 1 - on), button or switch off is log 0 (logic 0 - off). If light is on, we take it that the output value of the is LOG 1, when not lit, the value of the output value is LOG 0. Table of logic function "AND" that you have modeled will take the form shown in Fig. 3.2

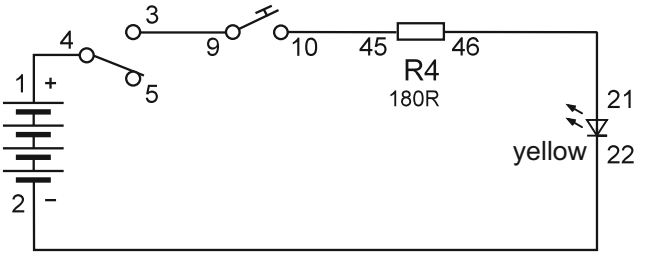



fig. 3.1

| Button | Switch | Light |
|---|---|---|
| LOG 0 | LOG 0 | LOG 0 |
| LOG 0 | LOG 1 | LOG 0 |
| LOG 1 | LOG 0 | LOG 0 |
| LOG 1 | LOG 1 | LOG 1 |

fig. 3.2

**Wires:**
2pcs -
2pcs - -
1pc - - -

**Wiring guide:**
1 - 4
3 - - 9
10 - 45
46 - - 21
22 - - - 2

# 4. Electrical circuit with button and switch in parallel connection

After the assembly of the circuit in fig. 4.1 or according to the "Wiring guide" insert the battery. Parallel wiring switches and buttons have the property that light can be switched independently either by button or switch. Unlike connection No.3, where the current can flow only one way, and it was only when the switch is closed and, in this connection, current can flow through closed either button or switche or both together. These properties correspond to the logic function "OR"). If we again mark the status buttons, switches and light with logical value, we obtain the "OR" table from fig. 4.2 As an example of this situation: If you go to buy pastry, you can buy either a croissant or roll, or both.

**Wires:**
2pcs -
2pcs - -
2pcs - - -

**Wiring guide:**

1 - 4
4 - - 9
3 - - -10
10 - 45
46 - - 21
22 - - - 2

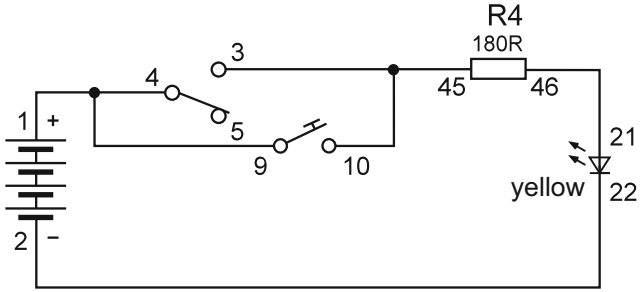



fig. 4.1

| Button | Switch | Light |
|---|---|---|
| LOG 0 | LOG 0 | LOG 0 |
| LOG 0 | LOG 1 | LOG 1 |
| LOG 1 | LOG 0 | LOG 1 |
| LOG 1 | LOG 1 | LOG 1 |

fig. 4.2

# 5. Serial connection of resistors

When experimenting with VOLTIK you will need to know how resistance can be combined to obtain a total resistance with a different value than has any of the six resistors included in your kit. There are many combinations of connections, but all are based on two basic ways of resistance connection: serial (consecutive) and parallel (side by side).

You can test features of a serial resistors connection according to the diagram in Fig. 5.1. After connecting and installing the battery the lights will shine. If the switch is in the up position, current must pass through two resistors, each reduces the total current in the circuit and light shines weakly. When you push the switch to the down position, the current does not have to flow through the resistor 560Ω, but only through 180Ω resistor, so the current is bigger and light is stronger. In this scheme there are two resistors in a series, but it is possible to connect more resistors. The resulting resistance R of series combination of resistors is equal to the sum of the individual resistances, in this case R = R6 + R4.

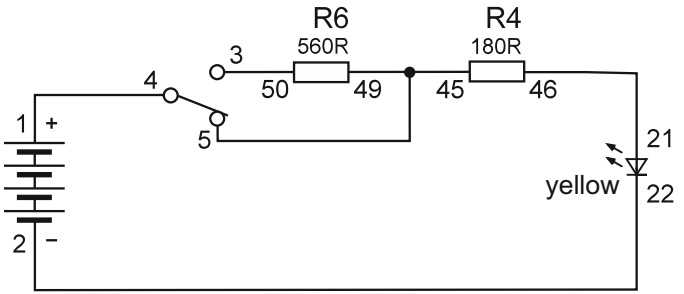



fig. 5.1

**Wires:**
2pcs -
1pc - -
3pcs - - -

**Wiring guide:**

1 - 4
3 - - - 50
5 - - - 49
49 - 45
46 - - 21
22 - - - 2

# 6. Parallel connection of resistors

On this circuit you can try what features will have connecting each resistor in parallel (side by side). Connect the circuit shown in Fig. 6.1 and insert the battery. Light will shine and after pressing the button will light stronger. The explanation is as follows: if the button is open, the current goes through a resistor 560Ω LED and light is somewhat weaker. After the press, the current passing through the two resistors simultaneously and is therefore greater. This is reflected by increasing the brightness of the LED diode. To better understand the principle imagine a situation where a crowd flows into the cinema by a door. When you open the second door, people will start to go in through these door too and the cinema will fill up faster. Let us return to our scheme. The serial connection according to the instructions No.5 the resulting resistance was greater than the resistance of any used resistor. In parallel, we can combine two or more resistors. The resulting resistance is always smaller than the smallest resistor in parallel. The resulting resistance R in our diagram is calculated as follows:

$$R = \frac{R6 \cdot R4}{R6 + R4}$$

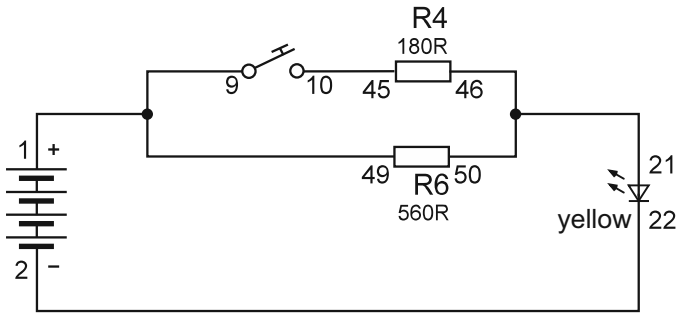



fig. 6.1

**Wires:**
1pc -
3pcs - -
2pcs - - -

**Wiring guide:**

1 - - - 49
49 - - 9
10 - - 45
46 - - 21
46 - 50
22 - - - 2

# 7. Way of the smallest resistance

Build a simple circuit diagram in fig. 7.1 or "wiring guide", insert the battery, light will shine. After pressing the button light goes out. One of the characteristics of electric current is that flows in an electrically conductive path which puts less resistance. In our model, the current passes with open button through resistance 180Ω and light, which shines because of the current. When you press the button, the current begins to "circumvent" light through the button that does have unlike light almost no resistance, and therefore light will go off.

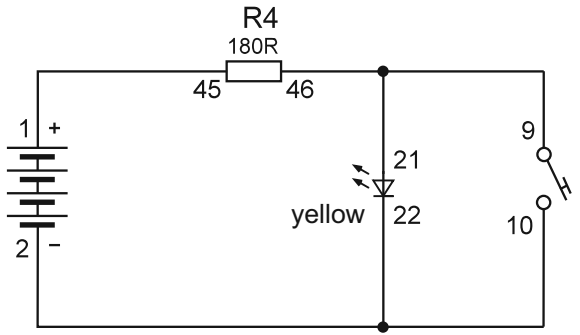



fig. 7.1

**Wires:**
3pcs - -
2pcs - - -

**Wiring guide:**

1 - - - 45
46 - - 21
21 - - 9
10 - - 22
22 - - - 2

# 8. Light circuit with color switching

After assembling the model in Fig. 8.1 and inserting the battery turns red or yellow light, depending on what position they happen to switch. So you can switch to alternate glow red and yellow. The circuit comprises, in addition to the voltage source, 180Ω limiting resistor, which protects the light against current overload and switch that forwards, depending on its position, current to one or the other light.

**Wires:**
1pc -
5pcs - - -

**Wiring guide:**

1 - - - 45
46 - - - 4
3 - - - 21
5 - - - 19
20 - 22
22 - - - 2

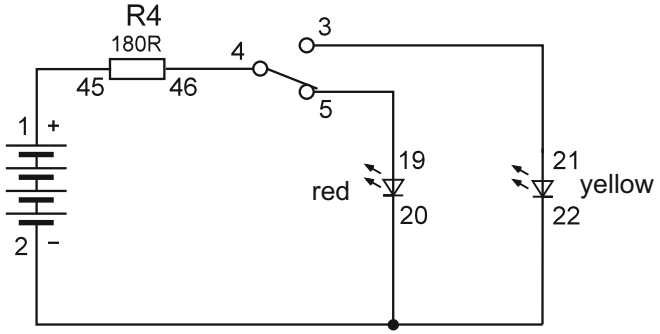



fig. 8.1

# 9. Potentiometer as a variable resistor

Connect the circuit as shown in Fig. 9.1 and insert the battery. Lights will shine strongly or weakly, depending on what position is the knob of the potentiometer. By turning the knob you can continuously vary the brightness of the light. To understand the function of the potentiometer it is good to know how it is mechanically designed. View of the potentiometer knob is Fig 9.2 The resistance track of horseshoe shape is made of the resistive layer of lacquer and its ends are conductively connected to the metal terminals. Between these terminals is stable resistance due to characteristics of the resistance track. In the kit there is a potentiometer 10 kΩ. It means that the resistive track has a resistance of 10 kΩ. Up to now it was identical electrical characteristics with firm resistance. The potentiometer has however additionally so called slider - metal sheet that touches the resistive track at one point and the point of contact can be changed by turning the knob. It follows that the resistance between the slider and one of the ends of the resistance track is dependent on the position of the slider, and that the sum of the resistances between the slider and the both ends of track is always equal to the total resistance of the resistance track. If a slider is turned completely to one end of the track, the resistance between the slider and that end of the track is almost zero, between the slider and the other end of the track almost equal to the total resistance of the resistive track. These properties can be verified if you change the position of the control knob and toggle switch. If the slider is in the middle, light will shine at both positions of the switch as well (slightly). If you rotate the knob off-center, it will change light brightness depending on what resistance is just between the slider and the end of the resistive track. Again, the smaller the resistance of the circuit, the greater the current and light emitting brightness.

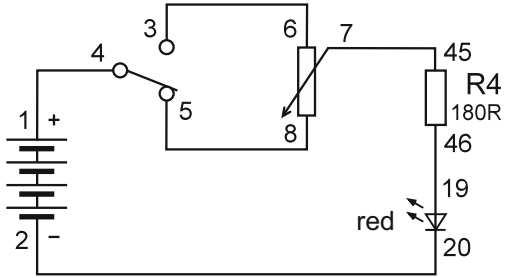



fig. 9.1

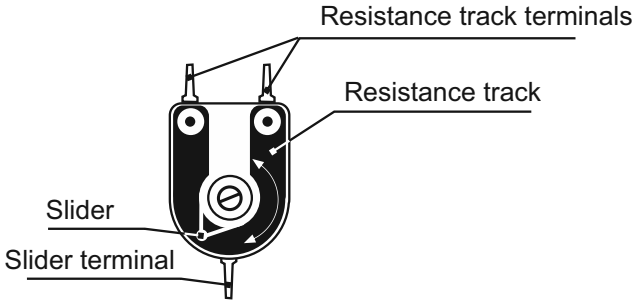



fig. 9.2 - potentiometer - schematic diagram

**Wires:**
3pcs -
1pc - -
2pcs - - -

**Wiring guide:**

1 - 4
3 - 6
5 - 8
7 - - - 45
46 - - 19
20 - - - 2

# 10. Potentiometer as a voltage divider

After connecting this circuit and inserting the battery you will be able to control the brightness of light using potentiometer until it stops shining, unlike previous wiring, where even in extreme position potentiometer slider light emitting faintly glowed. The potentiometer is in fact connected as a voltage divider. One end of the resistance track is connected to the positive (+) terminal of the source, the other end to the negative (-) terminal. At the slider terminal we get voltage, according to the slider position in range from full battery voltage (slider completely at the end of the resistance track, connected to the plus pole of the source) to zero (slider at the end of the resistive path connected to the minus pole of the source). Thus, if there is a slider at full voltage, light shines at full brightness (current that passes through light is limited by protective resistor 180 Ω), if there is zero voltage at slider, light shuts off completely. If the slider is at for example one-quarter of the resistance track, calculated from the end connected to the minus pole, the slider will also have one fourth of voltage connected to the potentiometer, in our case the one fourth of battery voltage.

**Wires:**
2pcs - -
3pcs - - -

**Wiring guide:**

1 - - 6
7 - - - 45
46 - - 19
20 - - - 8
8 - - - 2

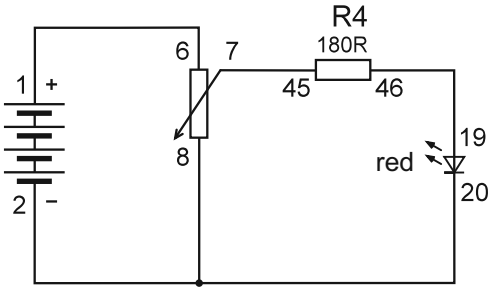



fig. 10.1

# 11. Colors changing

Connect the circuit according to the diagram in fig. 11.1, insert the battery and lights will shine one or both, depending on what position is exactly slider of potentiometer. If the slider is closer to the extreme position "-" yellow light shines brighter, if it is closer to the "+" red light shines brighter. Turning the knob can change the brightness of both lights so that it looks as if the light "spilled over" from one to another.

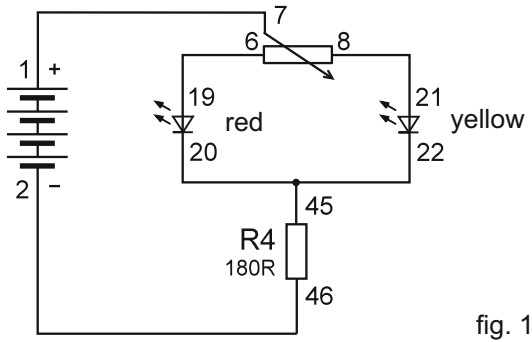



fig. 11.1

**Wires:**

1pc -
3pcs - -
2pcs - - -

**Wiring guide:**

1 - - 7
6 - - 19
8 - - - 21
20 - 22
20 - - 45
46 - - - 2

# 12. Capacitor - energy storage

Connect the circuit according to the diagram in Fig. 12.1 or according to "Wiring guide", slide switch down and insert the battery. Now move the switch up and the red LED flashes. Switch down and the yellow LED flashes. What happened in the circuit? A capacitor is an electronic component which is able to store electrical charge. It means that if you connect the capacitor to a voltage source (in our case the battery), the capacitor is charged and retains voltage even after disconnection of power. Now when you connect to the capacitor, an electrical appliance (in our case LED diode), the capacitor itself after a certain period as a voltage source and a light shines until the capacitor discharges. When charging through the capacitor flows current until the capacitor voltage equals the source voltage - that we signaled in our model red LED. When discharging yellow LED lights. Charging and discharging of the capacitor depends on the capacity (the greater the capacity, the longer the time) and the amount of electric current with which the capacitor is charged or discharged (the smaller the current is, the longer the battery is charging or discharging). In our circuit current is limited only by the resistance of 180 Ω, so charging and discharging is quick and light shines only briefly. If we wanted to extend the duration of shine, we would have to charge the capacitor through greater resistance, current would, however be small to lit LED to full brightness. This problem is easily solved by using a transistor, which you can try at other models. Unit of the capacity is 1F (Farad), in practice, however, are used capacitors with a capacity much smaller than 1F, that correspond to the commonly used units:

| | | |
|---|---|---|
| 1$\mu$F ( microfarad) | = | 1/1000 000 F |
| 1nF (nanofarad) | = | 1/1000 $\mu$F |
| 1pF (pikofarad) | = | 1/1000 nF |

In the schemes is not usually writen the letter "F" - the symbol for Farad capacitor value, as is evident from the schematic symbols, it is a capacitor and the value is in Farad.

Voltik II. includes ceramic capacitors with two terminals and two so called electrolytic capacitors (100µF and 2,2µF) having terminals labeled "+" and "-". When experimenting and connecting electrolytic capacitors in the circuit is necessary that the terminal "+" was connected to a higher voltage than terminal "-". During long reverse connection could the capacitor could be damaged.

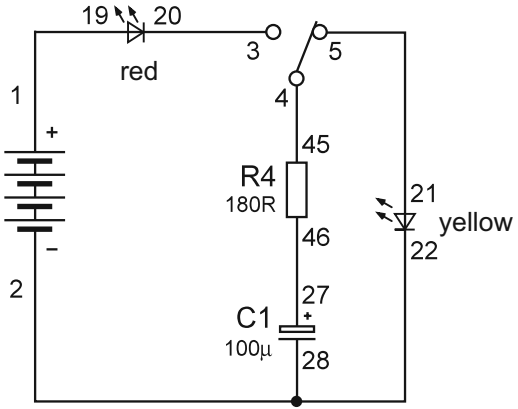



fig. 12.1

**Wires:**
1pc - -
6pcs - - -

**Wiring guide:**

1 - - - 19
20 - - - 3
4 - - - 45
46 - - - 27
5 - - - 21
28 - - 2
22 - - - 2

# 13. Experiment with transistor

The transistor is a semiconductor component with three terminals, which are called a base, in the diagram designated as (B), collector (C) and emitter (E). Most often, the transistor is used as an amplifier of electric current, in other words via the transistor we can using small changes in the current Ib flowing into the base of the transistor cause a large change in current Ic flowing into the collector of the transistor. Simplifying, one could say that a transistor represents between collector and emitter resistor whose value can be changed electronically (rather than mechanically, as with the potentiometer) by the size of the current Ib flowing into the base. Common transistors amplify more than 100 times, so for the switching current Ic = 100 mA is sufficient current to the base 1 mA. Current in our model flows by the scheme from the plus pole of the source (battery) and divides the current flowing into the base through a resistor R2 100kΩ and current flowing into the collector through the LED to a protective resistor R4 180 Ω. Both these currents are flowing out of emitter to the minus pole of the source. In the direction of the base-emitter transistor acts as a diode in the forward direction, we can simply say that it has negligible resistance. Base current is therefore determined by the size of resistor connected to the base (the larger the resistance, the smaller current). Connect now the circuit in Fig. 13.1 and after inserting the batteries you find that yellow LED glows faintly. The current flowing through the resistor LED diode 100 kΩ is too small. In connection 13.2 just this small current flowing through the same resistor 100 kΩ base is enough, for transistor switching, or to reduce the resistance between the collector and emitter so that the LED lights up. Try now disconnect the wire from the socket 56 - LED goes out, because you disconnected the current to the base of a transistor is open. Now grab the disconnected wire with fingers at uninsulated end and the touch socket 54 with the other hand to light up. If it does not happen, moisten your fingers and then touch. The body also represents the electrical resistance, which carry current sufficiently to switch the transistor on our connection.

If you experiment with a transistor, make sure the current always flows to the base through resistor. Otherwise you could destroy your transistor.

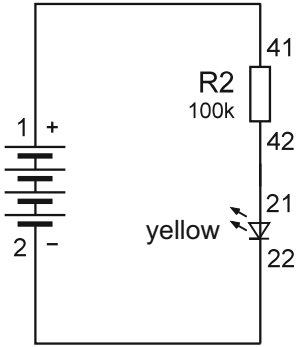



fig. 13.1

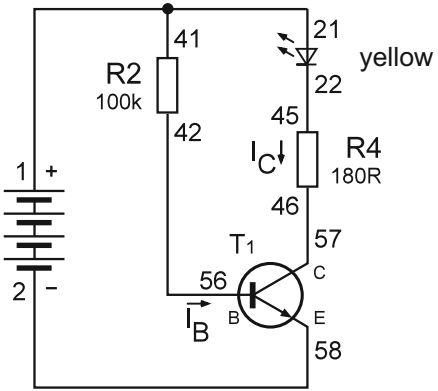



fig. 13.2

**Wires I.:**
3 pcs - - -

**Wiring guide I.:**

1 - - - 41
42 - - - 21
22 - - - 2

**Wires II.:**
1 pc -
2 pcs - -
3 pcs - - -

**Wiring guide II.:**

1 - - - 41
42 - - 56
58 - - - 2
1 - - - 21
22 - - 45
46 - 57

# 14. Simple transistor amplifier

In many cases where the input signal that we have available, is too small to switch on the transistor, it is necessary to connect several transistors in a row to increase the overall circuit gain. A simple amplifier - so called Darlington connection is on scheme 14.1. After connecting and installing the battery touch socket no. 56 and come closer to some (even switched off), electrical appliance (refrigerator, table lamp, etc.), the same result will be when you approach the wall with Voltik in places where there are under plaster wires wires switch. LED lights up, although at the base T1 seemingly no current flows. Your body now acts as an antenna for the surrounding electromagnetic field a by touch you bring into T1 base current size ten-thousandths of mA, which is, however, sufficient to partially open the transistor T1. Amplified current coming from the emitter T1 and T2 entering the base is sufficient to switch the transistor T2 and the red LED lights up. Although it appears that at the touch light emitts steady brightness, it actually flashes, in the rhythm of variations in ambient electromagnetic field, which changes in intensity of the voltage and current in the power network 50 times per second. Changes, however, are too fast for the eye and therefore perceived light is permanent. If you want to see this flashing, hold panel Voltik in one hand (thumb while touching the socket 56) closer to switch on the wall, until LED lights up, move the panel lightly reciprocating motion to the side and watch the LED diode.

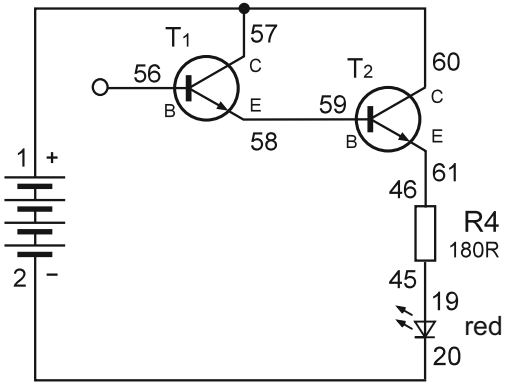



fig. 14.1

**Wires:**
2pcs -
2pcs - -
2pcs - - -

**Wiring guide:**

1 - - - 57
57 - 60
58 - 59
61 - - 46
45 - - 19
20 - - - 2

# 15. Staircase light

Connect the circuit as shown in Fig. 15.1 or a "wiring guide" and insert the battery. After pressing the yellow LED turns on and stays on even after you release the button, after a while it goes out. The same principle is used in lighting of common areas of apartment buildings, where in order to save electricity so called staircase switch turns off after a few minutes.

Explanation of the circuit is simple: When a button is pressed, it immediately charges the capacitor C1 to the battery voltage (immediately because the charging current from the battery is not limited by any resistance).

After the button is released, the capacitor will start discharging through resistor R2 100kΩ and transistor. The discharge current flowing into the base, after a certain time is large enough to keep transistor closed. When the capacitor is already very discharged, current to the base decreases, thus "closing" transistor and light fades out, until turns off.

**Wires:**
2pcs -
3pcs - -
4pcs - - -

**Wiring guide:**

1 - - - 9
9 - - 21
22 - - 45
46 - 57
58 - - - 2
28 - - 2
27 - - - 10
27 - - - 41
42 - 56

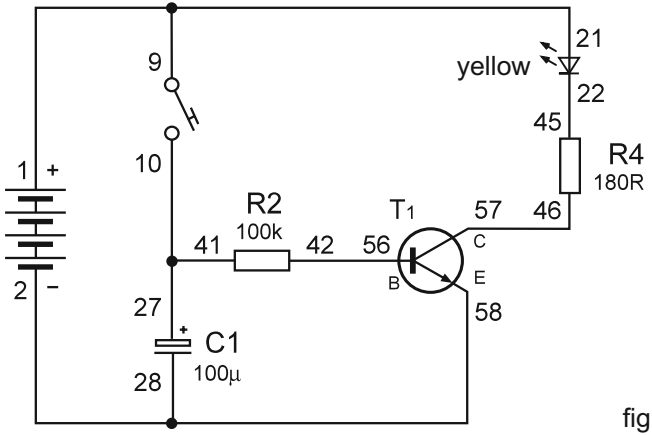



fig. 15.1

# 16. Rising and setting sun

Connect the circuit as in fig.16.1 or a "wiring guide", set the switch to the down position and insert the battery. Now switch to up position and patiently wait. Yellow LED shines after a while gradually to reach full brightness. Now switch to down position and LED starts slowly fades as a setting sun.

Explanation of the circuit is as follows. After the switch is in the up position to begin charging capacitor and until it rises the voltage to a level sufficient to "partially open" transistor amplifier, LED will shine. When the capacitor is fully charged, the LED reaches the full brightness. The reverse process occurs when the switch is in the down position, the capacitor is discharged gradually and light shines weaker until it turns off.

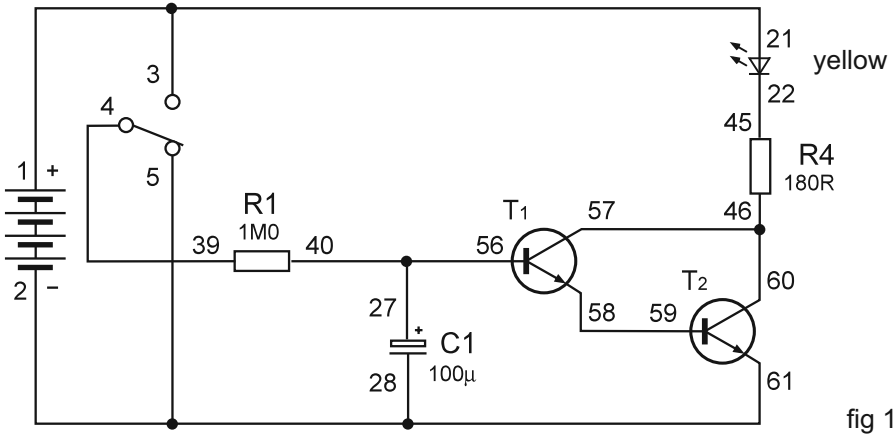



fig 16.1

**Wires:**
5pcs -
4pcs - -
3pcs - - -

**Wiring guide:**

1 - 3
3 - - - 21
22 - - 45
46 - 60
60 - 57
58 - 59
61 - - - 2
5 - - 28
28 - - 2
4 - - - 39
27 - - 40
40 - 56

# 17. Transistor oscillator - buzzer

Connect the circuit as shown in Fig. 17.1 or under "Wiring guide". The circuit is already somewhat complicated, so be sure to check after the partial connection of the oscillator to reduce the risk of error in the overall connection and control over the wiring of the entire circuit. If you are sure, insert the battery. Press a button - hear a tone from the speaker.

What is happening in this model? After button press the voltage is supplied to the circuit components and the connection method is selected so that it occurres as oscillations, or to automatically switch the alternately one or the other transistor. On the collector of T3 is a resistor R6 560Ω connected in parallel to a speaker, so that when transistor is being closed, current flows to the collector through the resistor R6 and through a speaker - a diaphragm is deflected.

When T3 is switched off, current stops flowing to collector, and a diaphragm returns to its initial position. Any such deviation causes the speaker cone to create sound waves, and if this process repeats itself, we perceive it as a tone. More the vibrations are frequent, the tone is higher. If you want the buzzer to beep louder, reconnect wire 25 - - 10 to 25 - - 60.

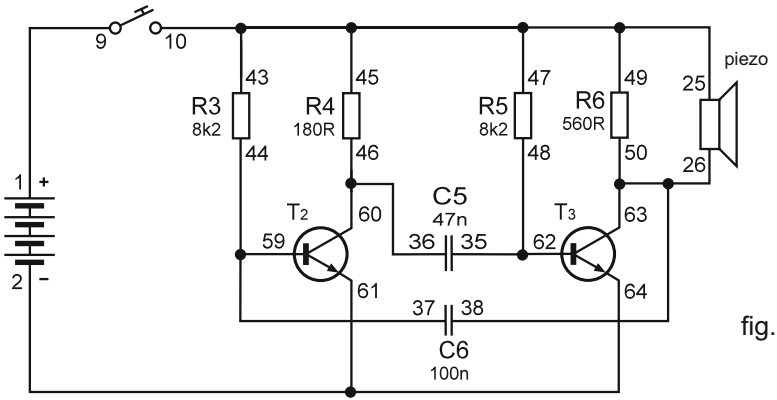



fig. 17.1

**Wires:**

9pcs -
6pcs - -
2pcs - - -

**Wiring guide:**

43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
Check wiring
44 - - 37
46 - - 36
48 - - 35
50 - - 38
43 - 10
9 - - - 1
61 - - - 2
25 - - 10 or 60
26 - - 63

# 18. Buzzer with alternating tone height

Connect the circuit as shown in Fig. 18.1 or under "Wiring guide". Do not forget the partial control and control of the entire circuit. Immediately after the battery is inserted, buzzer makes a sound. Transistor oscillator provides two continuous tones and a tone that can be continuously adjusted. If the switch is set down, continuous tone sounds, when the switch is in the up position, the tone sounds, which can be changed by turning the control knob of potentiometer. If you press the button, you hear, regardless of the switch and potentiometer, the highest tone. When you tune potentiometer correctly, you can simulate firetruck siren. Voltik also includes a model, where this happens automatically. If you want the buzzer beeping louder, reconnect wire 25 - - 9 to 25 - - 60.

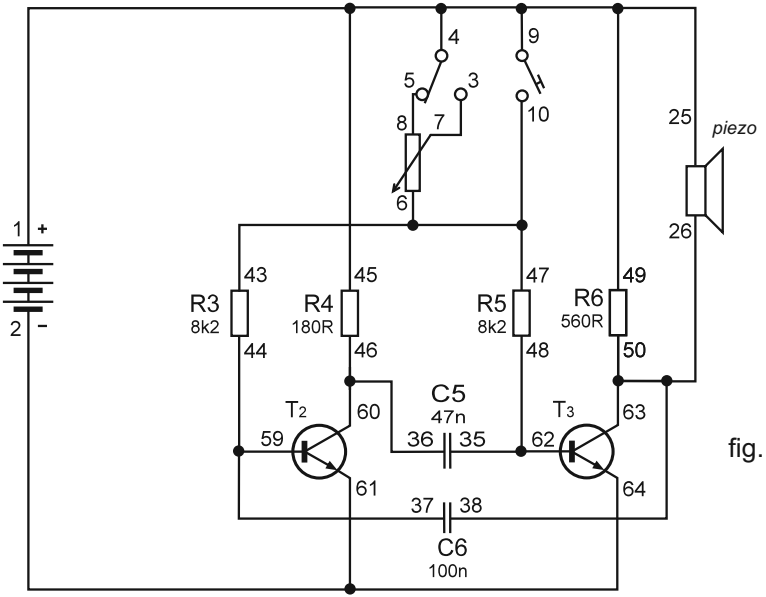



fig. 18.1

**Wires:**

8pcs -
10pcs - -
3pcs - - -

**Wiring guide:**

43 - 47
45 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
check wiring
44 - - 37
46 - - 36
48 - - 35
50 - - 38
61 - - - 2
45 - - - 1
1 - 4
3 - - 7
5 - - 8
6 - - - 43
4 - - 9
10 - - 47
63 - - 26
25 - - 9 or 60

# 19. Simple alarm

Connect the circuit as shown in Fig. 19.1 or by "Wiring guide". It is good to perform partial control after connecting of the oscillator, when there are not so many wires on the panel, thus reducing the risk of error in the overall connection. If your circuit is connected and checked, insert the battery and switch to the up position. If the ends of the alarm wires are disconnected, the buzzer (the pitch can be changed by a potentiometer) sounds and the red LED lights. If the end of alarm wires connect, the buzzer goes silent and the LED goes out. Now you attach ends of alarm wires for example to the drawer and wait, when you "catch" someone. If you want the buzzer sound louder, reconnect wire 25 - - 49 to 25 - - 60.

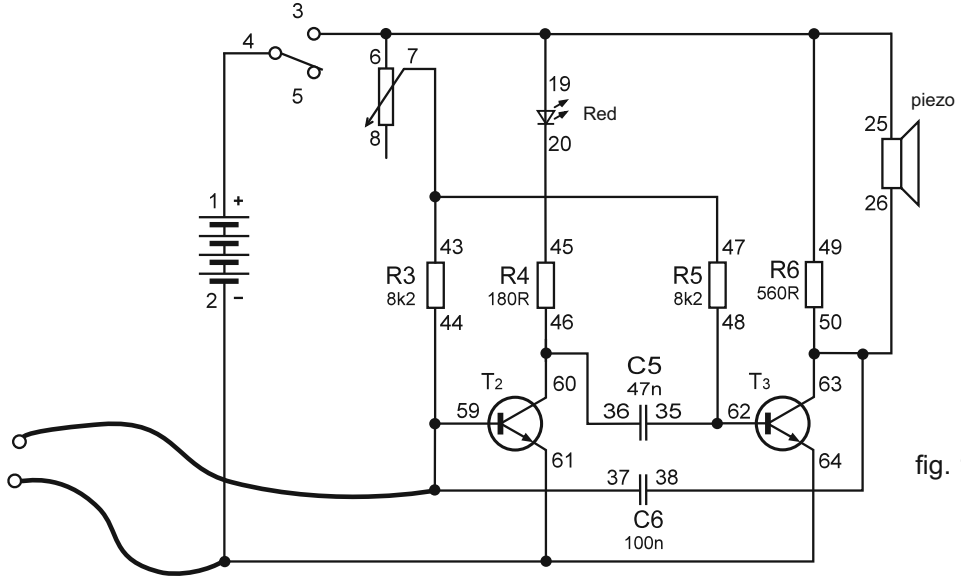



fig. 19.1

**Wires:**
7pcs -
10pcs - -
2pcs - - -

**Wiring guide:**

43 - 47
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiringj
1 - 4
3 - - 6
6 - - 19
25 - - 49 or 60
19 - - 49
7 - - - 43
26 - - 63
20 - - 45
61 - - - 2
alarm wires to sockets 2 and 59

# 20. Universal honker

Connect the circuit as shown in Fig. 20.1 or under "Wiring guide", perform partial control after connecting of theoscillator to reduce the risk of error in the overall connection and control over the connection of the entire circuit. Set the switch to the down position and insert the battery. Now switch up - the buzzer sounds. Turn the potentiometer knob to the middle, press button - tone increase. When you release the button again, it decreases. If you want the buzzersound louder, reconnect wire 25 - - 45 to 25 - - 60.

Using various settings of potentiometer and switching switch or button you can achieve different sound effects. For example the following three honkers:

- police siren: switch in the up position, the potentiometer set around the center of the resistance track, control using button.
- fault alarm signal: potentiometer set near the extreme position labeled "+", press and hold button, with changing switch position, you can achieve this effect.
- "LASER SHOTS" sci-fi laser gun sounds: turn the potentiometer completely to the extreme position marked "+"switch is in the up position and "shoots" are done by the button. Surely think of plenty of other sounds before someone comes to you saying, they cannot stand this noise any longer.

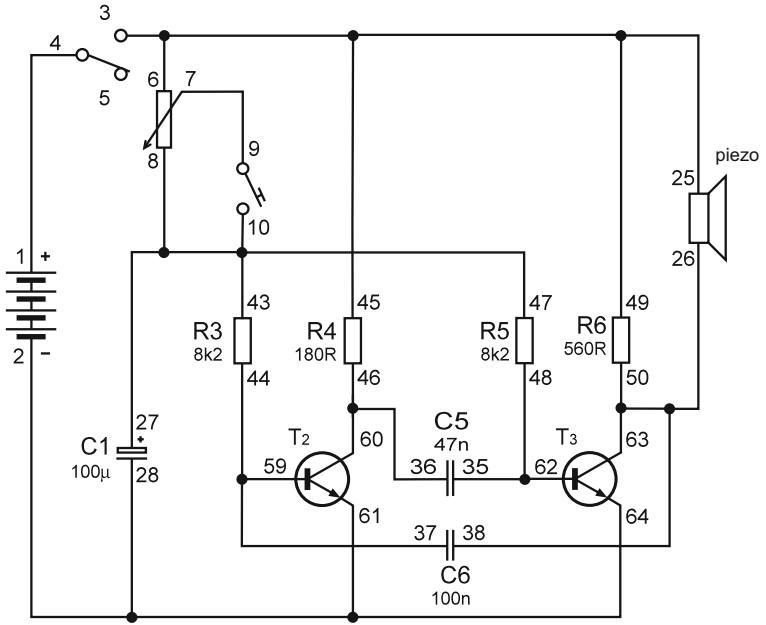



fig. 20.1

**Wires:**

9pcs -
10pcs - -
3pcs - - -

**Wiring guide:**

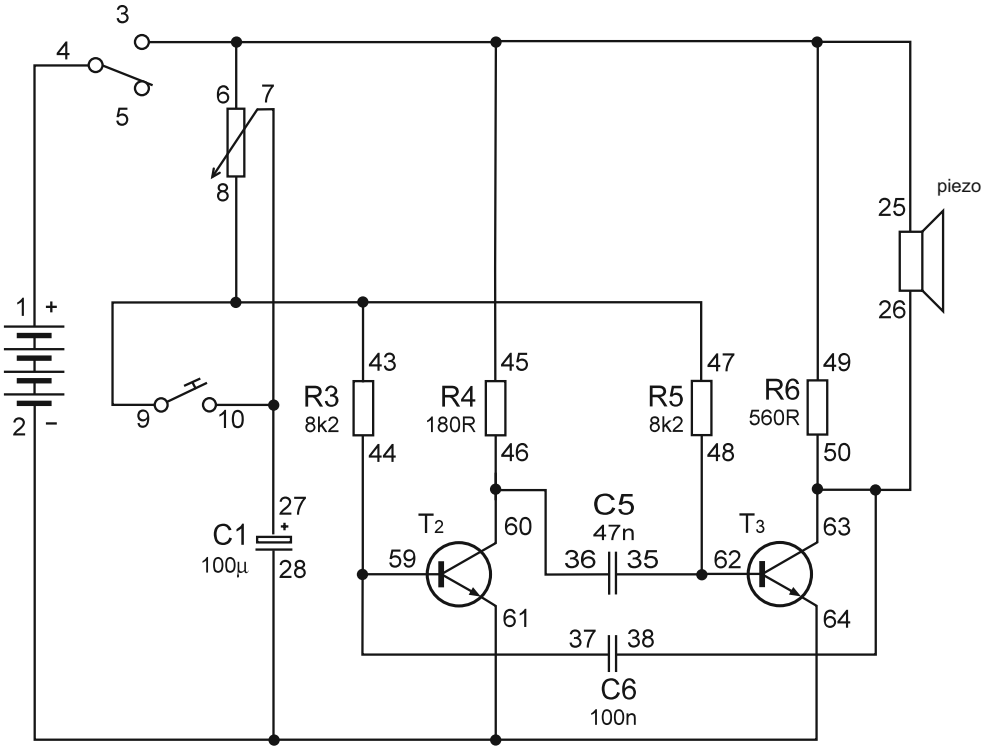
44 - 59
46 - 60
48 - 62
50 - 63
43 - 47
45 - 49
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
2 - - - 61
1 - 4
3 - - 6
6 - - - 49
7 - - 9
10 - 43
28 - - 2
27 - - - 10
25 - - 45 or 60
26 - - 63
8 - - 27

# 21. Interesting honker

Connect the circuit as shown in Fig. 21.1 or under "Wiring guide", insert the battery and switch the switch to the up position - the buzzer sounds. Set potentiometer approximately to the center and press button. Tone jump increases and decreases, after releasing the button, it immediately decreases and rises slowly. Pitch at this interesting horn can be changed using the potentiometer. If you want the buzzer louder, reconnect wire 25 - - 49 to 25 - - 60.

**Wires:**
8pcs -
12pcs - -
2pcs - - -

**Wiring guide:**
44 - 59
46 - 60
48 - 62
50 - 63
43 - 47
45 - 49
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
61 - - - 2
1 - 4
3 - - 6
7 - - 27
28 - - 2
8 - - 9
9 - - 43
7 - - 10
6 - - - 45
25 - - 49 nebo 60
26 - - 63


3
4
5
6
7
8
1
+
2
–
9
10
R3
8k2
43
44
R4
180R
45
46
R5
8k2
47
48
R6
560R
49
50
C1
100µ
27
28
T2
59
60
61
C5
47n
36
35
T3
62
63
64
37
38
C6
100n
piezo
25
26

obr. 21.1

# 22. Field telephone

This model is designed for voice communication between two Voltiks connected by two long wires. If you do not have two Voltiks, it is possible according to the diagram to connect instead of the second Voltik phone headphone plug 50Ω (see Introduction). Then you can talk to speaker, which serves as a microphone and an earpiece (in another room for example) and your voice will be heard in another room. If you leave switched Voltik in one room, in the second room you can hear what is spoken.

Connect the wires parts this time **exactly** by "Wiring guide", perform partial control of wiring and mounting quality of wires at the output to reduce the risk of error in the overall connection and do not forget the overall control after the completion of wiring. Turn the potentiometer to the middle and insert the battery. To verify correct operation of the amplifier, switch the switch to the down position - "reception" and touch the socket no.56 - speaker must growl lightly when touched. Be careful if you have already connected long connecting wires, so the bare wire ends do not touch. Now you can connect both equally connected and checked Voltiks and begin to make the connection:

The phone operates in different manner than a phone to which you are accustomed. It is rather similar to radio, where only one party can talk at a time and the other listens.

Lets say, that both John and George have one Voltik.

- both of them have "reception" on, so they can hear prompt from the other one.
- John calls George:

John switches switch to the up position "transmit" and says to the speaker: "GEORGE, GEORGE, JOHN HERE, OVER". Then switches to the position "reception" and waits for Georges respond. If it does not come, he can repeat prompt the same way (he can whistle to the speaker - it will be heard by George better).

- George can respond to John like this:

he will switch to "transmit" and say to his speaker: "JOHN, HERE IS GEORGE, OVER". and waits, what will John tell him.

- In the dialog every time, when you are done speaking, you say "OVER", switch to"reception" and let the other one speak.

- When "transmitting" set potentiometer to the position, that sound from the second Voltik od headphone is as clear as possible.

- Do not put two Voltiks too close to each other, because there will certainly be so called acoustic feedback and Voltik, which is currently receiving, will start whistling.

- If you will use headphone instead of second Voltik, you switch to position "transmit", in position "reception" the speaker (microphone) is disconnected.

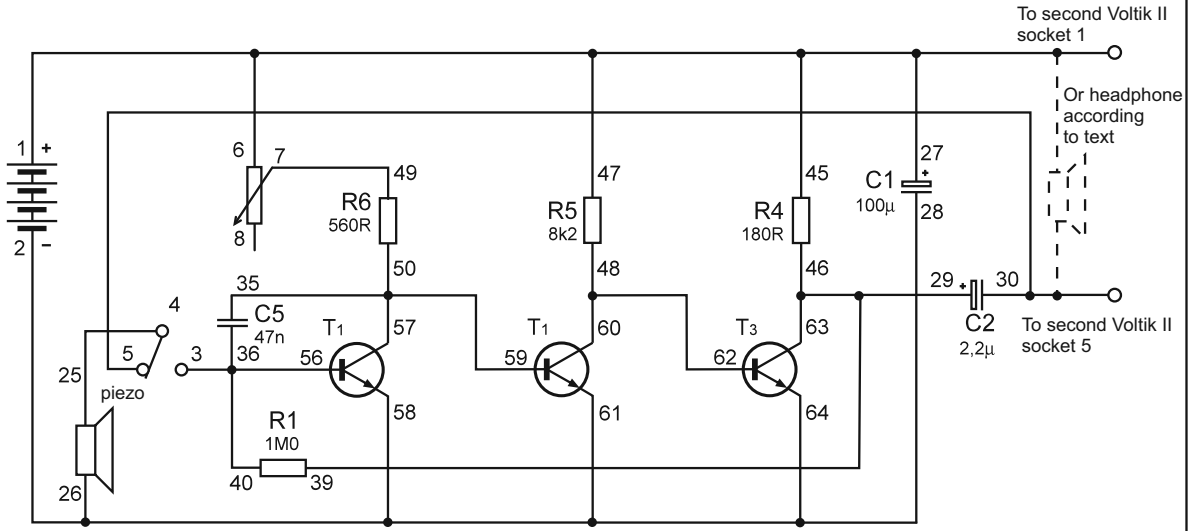



fig. 22.1

**Wires:**

8pcs -
7pcs - -
8pcs - - -

**Wiring guide:**

58 - 61
61 - 64
57 - 59
60 - 62
63 - 46
60 - 48
57 - - 50
46 - - 39
40 - 56
45 - 47
check wiring
58 - - - 2
58 - - 26
40 - - - 3
4 - - - 25
5 - - 30
63 - - - 29
1 - - 6
6 - - - 45
7 - - - 49
28 - - - 64
27 - - - 47
59 - - 35
56 - - 36
5 connection 5
1 connection 1

# 23. Crystal radio - receiver without battery

Crystal radio connection is thing with which our great-grandfatcher had a lot of fun at a time when radio broadcasting was still in its infancy.

Crystal radio works as follows: Radio waves from wave transmitters of different stations enters the antenna. Coil together with a capacitor connected in parallel form a so-called tuned circuit, which amplifies the current station and suppress others. Your crystal radio is tuned by sensitive scrolling of ferrite core in the coil, and stations that are achievable by tuning are situated within the zone called medium waves, otherwise too AM 530-1600 kHz. An essential part is the diode. This component converts the high-freqency signal from the tuned circuit into a signal that can be heard in piezo - speaker.

Given that your crystal radio has no amplifier and input tuned circuit is very simple, it is necessary to help to the good results by absorbing as much of the surrounding radio wave energy. It is therefore necessary that the antenna is comprised of at least 10m long wire (basically the longer the better), which can be placed in the room so that the reception of the strongest possible and necessary, it is also for grounding - connecting the crystals to the metal of the central heating system or tap water tubes.

Connect the circuit shown in Fig. 23.1, install the antenna and the ground and put your ear to speaker. By gradually shifting the core of the coil, try to capture the sound of some nearby stations. Prepare yourself for the fact that the sound is very weak, but by an extension of a suitable choice of antenna position or using other circuit variants (Fig. 23.2) you can achieve surprising results. The capacitor in the input tuned circuit designated C as C4 220pF. You can instead try a 100 pF or parallel or serial or a combination of both capacitors (as indicated by dashed lines). Instead of piezo - speaker you can connect the phone pad or headphone earbud. Radio show can be heard better.

Since this model is not connected to battery power, you can freely experiment with connection and hunt sounds in the ether. There is no risk that you destroy any component.

**Wires:**
3pcs - -
2pcs - - -

**Wiring guide: fig. 23.1:**

53 - - 33
52 - - 54
55 - - - 25
51 - - 34
51 - - - 26
antena 53
grounding 51

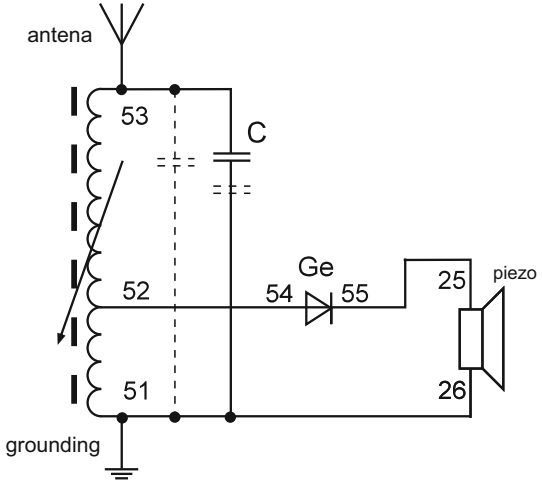



fig. 23.1

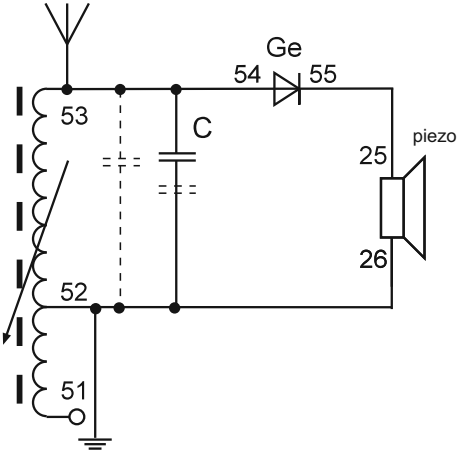



fig. 23.2

# 24. Radio receiver with loud reception

The model shown in Fig. 24.1 is different from crystal radio by amplifier that amplifies the signal and enables listening to the radio program on AM 530-1600 kHz aloud from a speaker.

The construction of this model is somewhat more complex and therefore divided into three stages, after which always follows the control of a circuit. First connect the amplifier section and check the connections and the quality of the wires. Complete connection of the circuit amplifier and test its function by turning the potentiometer to the middle, insert the battery, set the switch to the up and touch socket no.56 with your finger - speaker should growl when touched lightly. Remove the battery and connect the rest of the circuit. Now, install the antenna and ground according the diagram, insert the battery and by slow ejecting or plugging coil core, try to tune in a station. Once you succeed, set as possible purest sound by adjusting potentiometer or the location and size of the antenna. Instead of capacitor C3 in the input tuned circuit you can try a capacitor C4 or parallel or serial combination of both capacitors (as indicated by dashed lines). Like with the crystal radio at first result will not be 100% and will require experimentation mainly with the antenna. Do not expect too, that your radio will perform comparably to a normal radio you can buy. The circuit is too simple. It is also certain that the signal in different places of the country will have a different intensity. With a bit of patience surely result will be achieved.

**Wires:**
11pcs -
11pcs - -
5pcs - - -

**Wiring guide:**
58 - 61
61 - 64
57 - 59
60 - 62
63 - 46
60 - 48
57 - - 50
46 - - 39
40 - 56
45 - 47
check wiring
58 - - - 2
64 - - 26
63 - - 25
3 - - - 45
3 - - 6
7 - - - 49
1 - 4
check amplifier
28 - - - 64
27 - - - 47
2 - 51
51 - - 32
31 - - 53
52 - - 54
55 - - 37
40 - 38
59 - - 36
56 - - 35
grounding 2
antenna 53

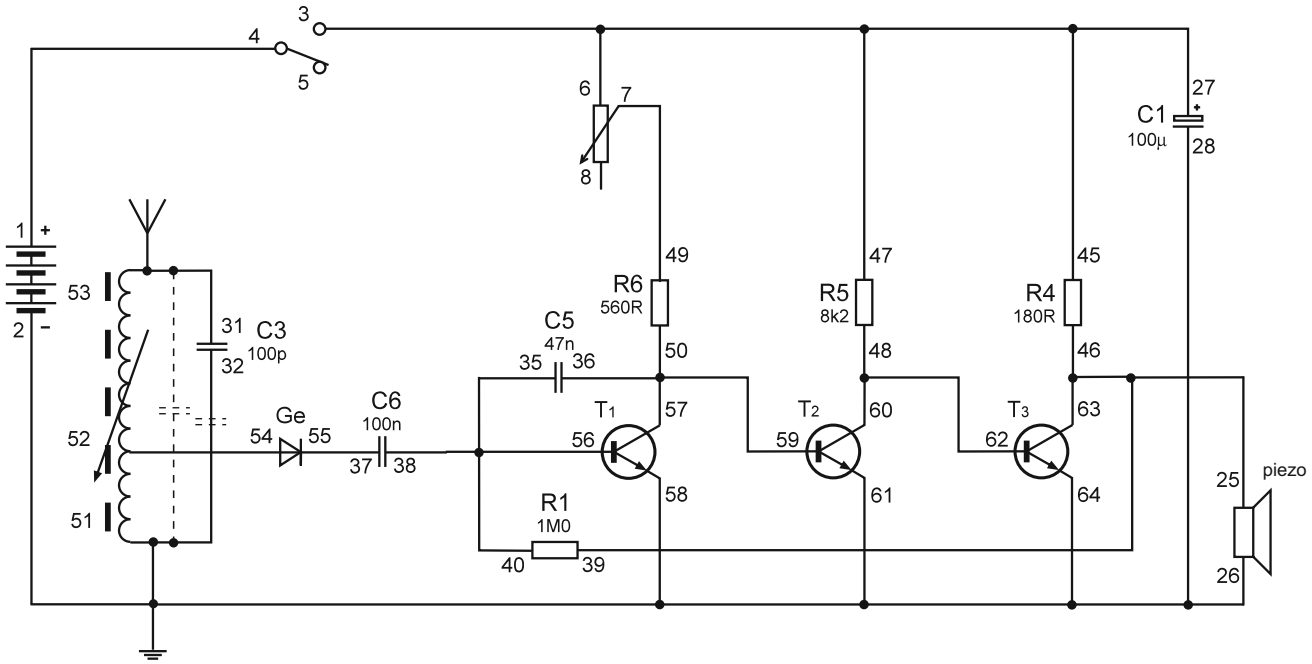

3
4
5
6
7
8
27
C1
100µ
28
1
+
2
-
53
31
C3
100p
32
52
51
Ge
54
55
C6
100n
37
38
C5
47n
35
36
49
R6
560R
50
47
R5
8k2
48
45
R4
180R
46
T1
57
56
58
T2
60
59
61
T3
63
62
64
R1
1M0
40
39
25
piezo
26

fig. 24.1

# 25. Contactless metal detector

Connect the circuit as shown in Fig. 25.1 or under "Wiring guide". Tune in in band AM 530-1600 kHz a channel, which is difficult to hear or noisy. Place Voltik for a start to a maximum distance of 2 meters from the radio. Insert the battery, set the switch to the up and now slowly shift the core of the coil to achieve that on the radio you hear the beep, which responds to the movement of the core. Now, try to tune by the core the lowest possible tone on the radio and the device is ready. As you approach to the coil of your Voltik metal object, the radio is raising the tone. You should try which station fits best for this purpose - when the beep is the most distinctive. When tuning using core coils you can sometimes find two or more core positions when radio responds and it is necessary to choose the best one. If you have tuned your detector, you can also go with it across the room and put the coil closer to various metal objects and listen the whistle on the radio.

Metal detector that you have built, is actually a simple transmitter in AM band 530-1600 kHz whose frequency is dependent on the inductance of the coil. It varies with the position of the core in the coil (the extent of its insertion), but also proximity of metal object to the coil. The radio signal coming from the radio in your detector is composed of a weak signal station you tuned in advance and the result is whistling in the loudspeaker.

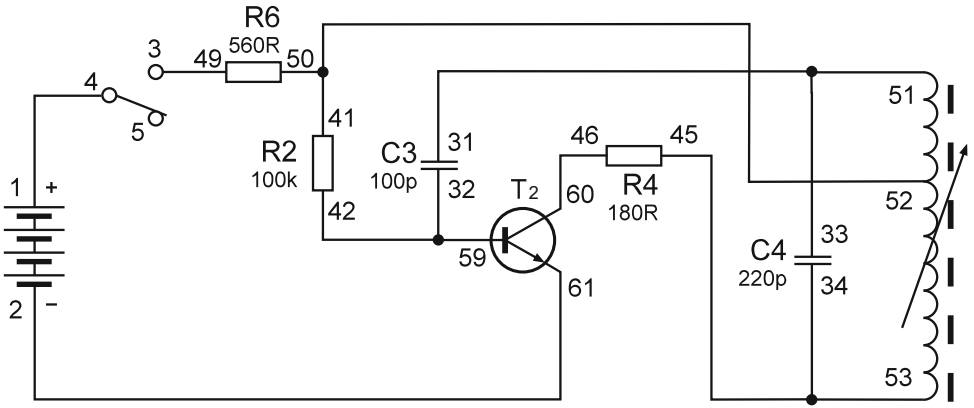



fig. 25.1

**Wires:**

3pcs -
5pcs - -
4pcs - - -

**Wiring guide:**

2 - - - 61
60 - 46
59 - - 42
50 - - 41
59 - - 32
33 - - 51
33 - 31
34 - - 53
53 - - - 45
52 - - - 41
1 - 4
3 - - - 49

# 26. Simple radio station in the medium wave band

Simple transceiver as shown in Fig. 26.1 captures ambient sounds and transmits them using a high frequency oscillator for a short distance (for example, to the neighboring room), where it is possible to hear these sounds on the speaker of the normal radio receiver.

Similarly to model no. 25 even here high-frequency oscillator forms a substantial part. It oscillates at a frequency in the range between 530kHz to 1600kHz, depending on what position is currently ferrite core in the coil. Antenna of your Voltik then transmits radio waves that can be received with normal radios in AM 530-1600 kHz.

The oscillator is now connected to the speaker as a microphone. It affects (modulates) oscillator according to the sound coming into the microphone, so that the radio waves emitted by the transmitter to your Voltik contain audio information. Electronic circuits in radios again converts radio signal coming from your Voltik to sound audible in the radio's speaker.

Construct the model shown in fig. 26 or a "wiring guide". For starters, if you have a radio nearby Voltik, it is not necessary to connect the antenna or grounding. Now tune on radios in AM 530-1600 kHz (medium waves) frequency, at which is not heard any station (or poorly), insert the battery into the enclosure on the side panel of Voltik and turn the power on (switch up). Gently slide the ferrite core in the coil of Voltik, tune your transmitter so that the noise on the radio respond to the movement of the core. Now blow into the microphone or talk into it and try to find a core position where the radio sound is heard most strongly. If you find more such places, select the one where reception is strongest on the radio. If you do your transmitter works this way, you can try, at what distance you will still hear the radio signal from your transmitter. It obviously will not more than a few meters, and the intensity will depend on the direction of Voltik. If you want to transmit over greater distances or to the next room, you need to connect the socket no. 51 with wire to central heating or water pipe as a ground, and into the slot 53 connect a long wire from your kit as an antenna. After connecting the antenna and grounding it is necessary to fine-tune the transmitter again by shifting the ferrite core in the coil at the highest volumes.

Note: When tuning you will certainly find that the device is sensitive to changes in the position of the connecting wires. Their relative capacity changes and that de-tunes high frequency oscillator. It is therefore appropriate to move as little as possible with Voltik when tuning in.

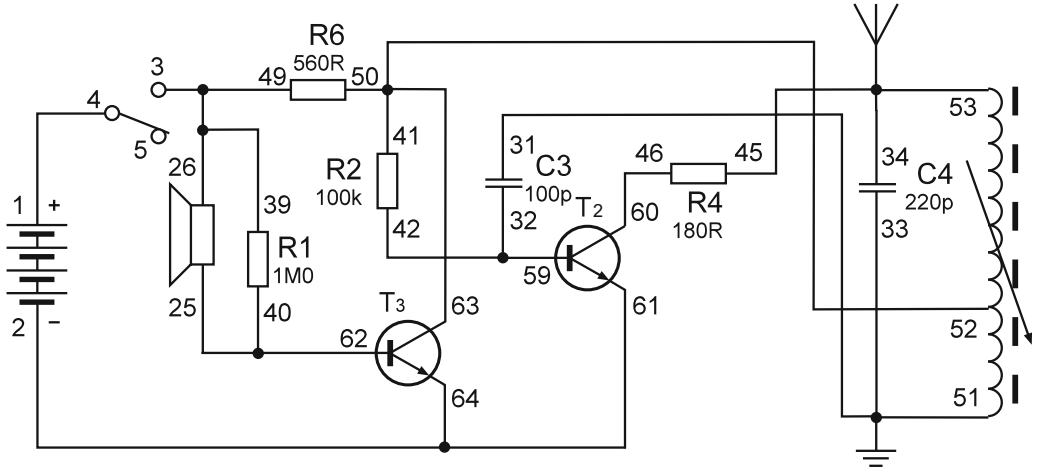



fig. 26.1

**Wires:**

6pcs -
8pcs - -
4pcs - - -

**Wiring guide:**

2 - - - 61
60 - 46
59 - - 42
50 - - 41
59 - -32
33 - - 51
33 - 31
34 - - 53
53 - - - 45
52 - - - 41
1 - 4
3 - - - 49
61 - 64
50 - 63
40 - - 62
62 - - 25
26 - 49
26 - - 39
antenna 53
grounding 51

# 27. Sensor button with integrated circuit 555

Now you have the opportunity to learn about one of the most popular integrated circuits, whose popularity results mainly from its wittily chosen structure and versatility. There are dozens of typical wirings of flashers, buzzers, timers, but also measuring circuits for entertainment and professional applications.

Sockets belonging to the integrated circuit are numbered 11 to 18 and when you subtract 10 from them, it corresponds to the numbers of terminals of the integrated circuit.

555 is mostly used as a flip-flop with two stable states - ON or off. Depending on what is the voltage on the input circuit, then on the output socket (No.13 / Pin # 3) in ON state is voltage similar to the battery voltage, in the OFF state voltage is near zero.

Connect the circuit as shown in Fig. 27.1 or under "Wiring guide", insert the battery and leave Voltik on the table without touching it. You can turn red LED on with touch of finger to socket no.12 and off by touching the socket 16. If you are unable to turn LED off, put Voltik near a table lamp, which is stronger electromagnetic field (experience of instruction no. 14).

**Wires:**
3pcs - -
2pcs - - -

**Wiring guide:**

1 - - 18
2 - - - 11
13 - - 19
20 - - 45
2 - - - 46

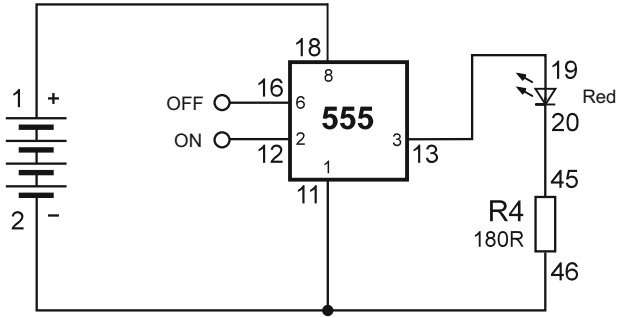



fig. 27.1

# 28. Buzzer with big tone range

Connect the circuit as shown in Fig. 28.1 or under "Wire guide" and you get a buzzer. Its tone can be tuned by potentiometer up to the upper limit of audibility. Instead of capacitor 100n C6 you can try to use side - C5 47n, the tuning range will be different.

If you want to get a sound similar to the sound of the engine, connect instead of the capacitor 100n the 2,2 $\mu$ capacitor - caution to the polarity of capacitor - socket 30 must be connected to socket 11 and socket 29 to socket 12, not conversely, you could damage an electrolytic capacitor.

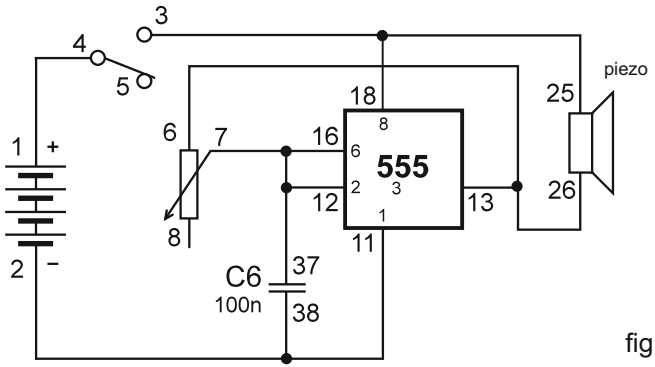



fig. 28.1

**Wires:**
2pcs -
7pcs - -
1pc - - -

**Wiring guide:**

1 - 4
3 - - 18
2 - - - 11
12 - 16
16 - - 7
6 - - 13
13 - - 26
18 - - 25
12 - - 37
11 - - 38

# 29. Flasher with integrated circuit 555

Connect the circuit as shown in Fig. 29.1 or under "Wiring guide" and after inserting the battery and turnin on the switch yellow and red LEDs will blink alternately as a some kind of fault indication. Blink rate can be adjusted by adjusting potentiometer.

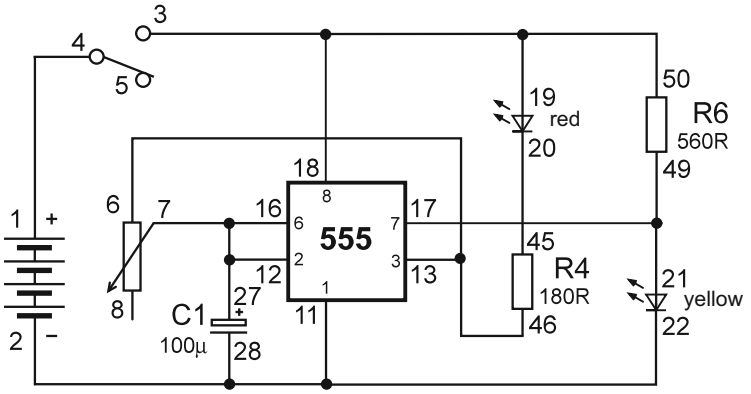



fig. 29.1

**Wires:**
2pcs -
11pcs - -
2pcs - - -

**Wiring guide:**

1 - 4
3 - - 18
2 - - - 11
2 - - 28
27 - - 12
12 - 16
16 - - 7
18 - - 19
19 - - - 50
49 - - 21
21 - - 17
6 - - 13
13 - - 46
20 - - 45
22 - - 11

# 30. Lightning flasher - stroboscope

Connect the circuit as shown in Fig. 30.1 or under "Wiring guide" and carefully check the wiring. Insert the battery and turn on the switch. Green light should start flashing intensely. ATTENTION! if LED permanently shines in high brightness, immediately turn off the model, because it could burn. To achieve the lightning effect there is not included protective resistor, which is okay, when this light flashes.

Blink rate can be controlled using a potentiometer. If you set the speed to maximum, you get strobe effect. Real stroboscope is a device for creating lighting effects in a theater or at discos. It essentially is very powerful lamp, which flashes and illuminates the scene always just a brief moment, so we see the movement intermittently. If you turn on your strobe light in total darkness, you can simulate said effect.

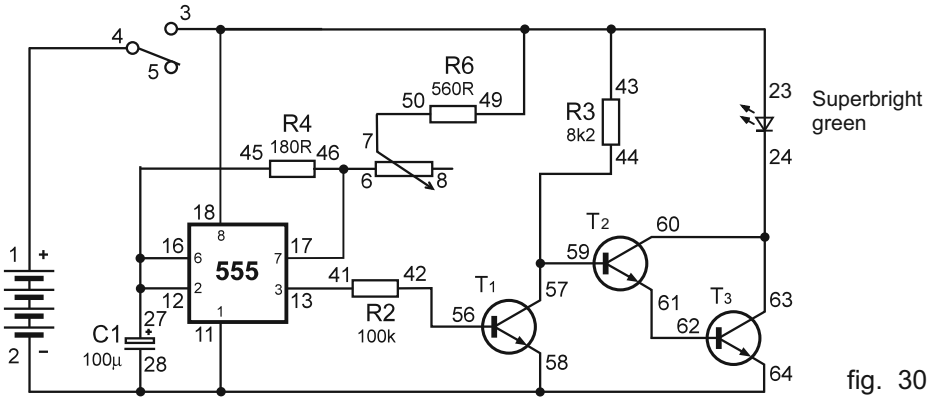



fig. 30.1

**Wires:**
7pcs -
8pcs - -
7pcs - - -

**Wiring guide:**
1 - 4
3 - - 18
2 - - 28
2 - - - 11
12 - 16
12 - - - 27
17 - - 6
7 - - - 50
17 - - - 46
16 - - 45
13 - - 41
18 - - - 49
49 - - 23
23 - - 43
24 - - - 63
63 - 60
44 - 57
57 - 59
42 - 56
58 - - 64
61 - 62
28 - - - 58

# 31. Electronic metronome

Metronome serves to musicians to keep rhythm when practicing songs. Metronome that you can build as shown in Fig. 31.1 or under "Wiring guide" makes rapping in precise rhythm, which speed can be changed using a potentiometer.

Rapping is weak, but if you whistle according to your metronome, the volume will suffice.

**Wires:**
5pcs -
8pcs - -
5pcs - - -

**Wiring guide:**

1 - 4
3 - - 18
18 - - - 49
49 - 47
2 - - 28
2 - - - 11
28 - - - 64
27 - - 12
12 - 16
16 - - 45
6 - - 17
17 - - - 46
7 - - - 50
25 - - 48
48 - 63
44 - - 62
13 - - 26
26 - 43

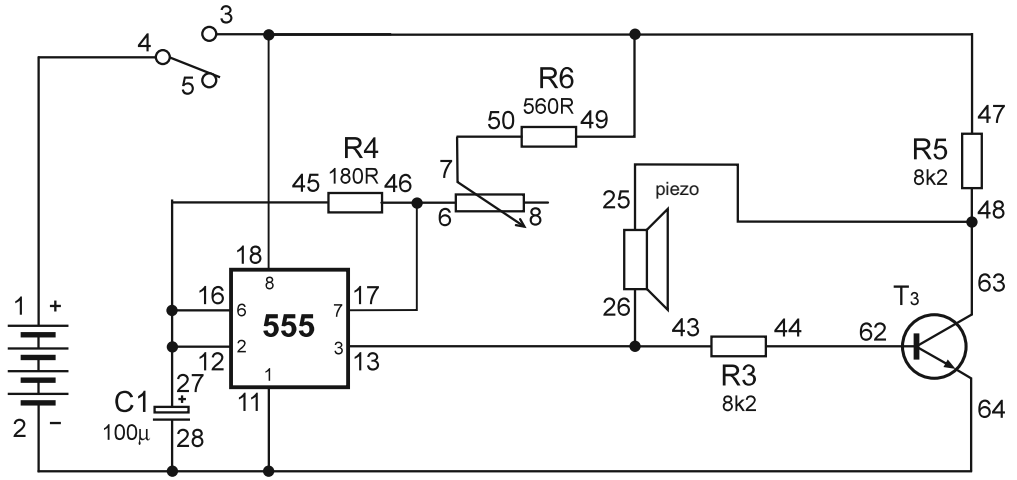



fig. 31.1

# 32. Touch controlled buzzer

In this scheme, we use connection 555 as in the connection No.27, but instead of light we will connect electronic buzzer. After inserting the battery and turning on the switch buzzer can be turned on and off only by touching the terminal No.12 and No.16. If you can not turn off the buzzer, put Voltik close to for example a table lamp and do not touch the Voltik panel anywhere else, than the sockets No.12 and No.16. fig. 32.1

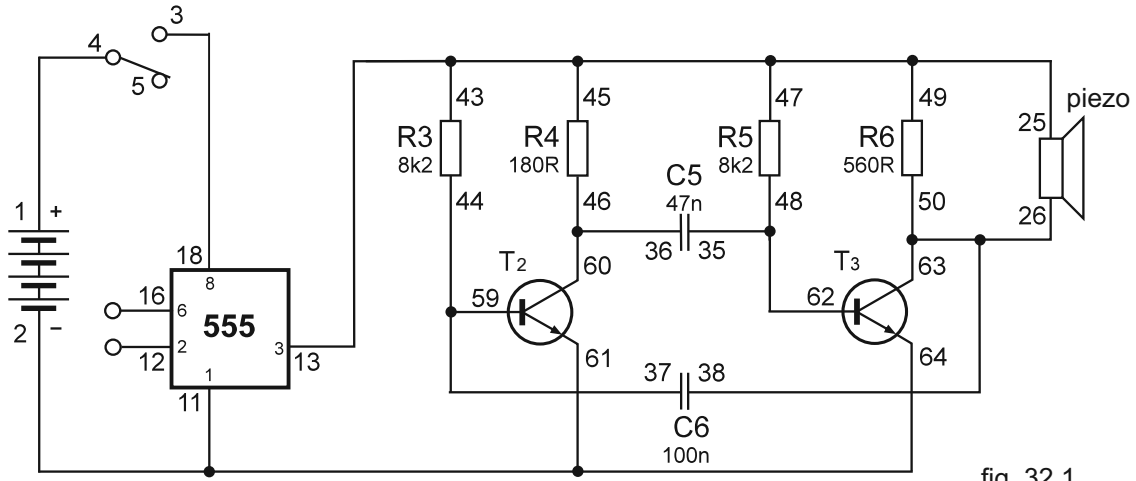



fig. 32.1

**Wires:**
9pcs -
8pcs - -
2pcs - - -

**Wiring guide:**

43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
2 - - - 61
2 - - - 11
1 - 4
3 - - 18
13 - - 25
43 - - 13
63 - - 26

# 33. Modulated horn

This horn is an enhanced form of horn No.20, where you control it manually. Here it is controlled by the circuit 555, which, thanks to other components regularly alternates ON and OFF on output (socket. 13), thereby alternately turns on and off transistor oscillator. Because the oscillator is connected to capacitor C1 100µ, moving tone occurs when the capacitor is being charged.

Wire the circuit as shown in Fig. 33.1 or under "Wiring guide", insert the battery and turn on the switch. Buzzer starts intermittently beep and at switch-on slower tone always rises. You can change the pitch using a potentiometer. Tone height can be changed by connecting the resistor 1M0 (indicated by the dashed line) instead of 100k. If you disconnect connection to the capacitor C1 100µ (6 - - 27), the horn will sound intermittently without moving tones.

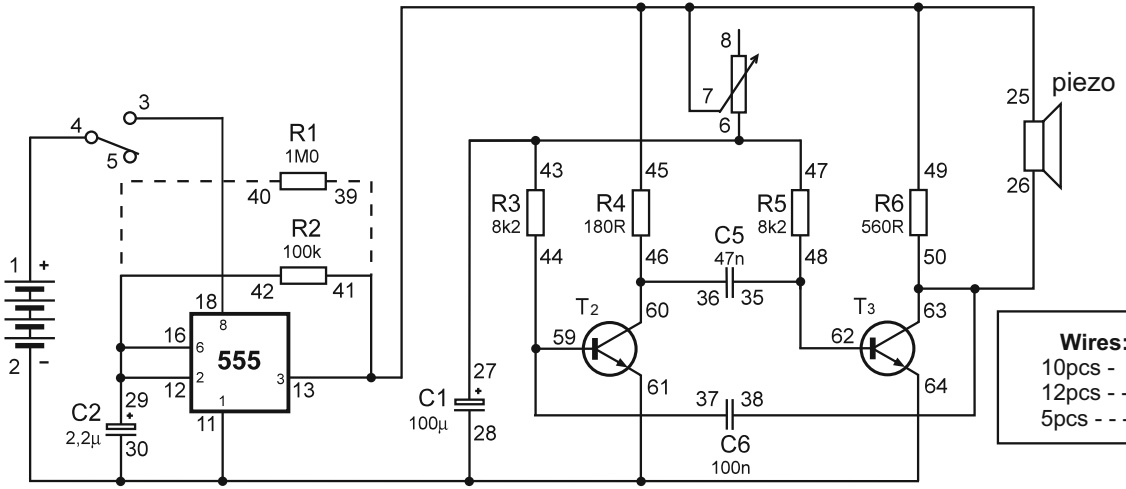



fig. 33.1

**Wires:**
10pcs -
12pcs - -
5pcs - - -

**Wiring guide:**
43 - 47
45 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
2 - - - 61
2 - - - 11
11 - - - 28
28 - 30
29 - - 12
12 - 16
16 - - 42
1 - 4
3 - - 18
7 - - - 49
6 - - 27
6 - - - 43
13 - - 7
25 - - 45 or 60
13 - - 41
63 - - 26

# 34. Alarm honker

Honker as in fig. 34.1 gives warble like a police siren. If you connect the alarm wires according to the diagram, you can use the model as a burglar alarm and wire ends install according to instructions no. 19th The alarm is actuated when contact between alarm wires is severed.

If you disconnect the wire 27 - - - 8, you disconnect the capacitor C1 100µ, and the horn will emit alternately higher and lower tone, according to the potentiometer adjustment, without moving changes in tone.

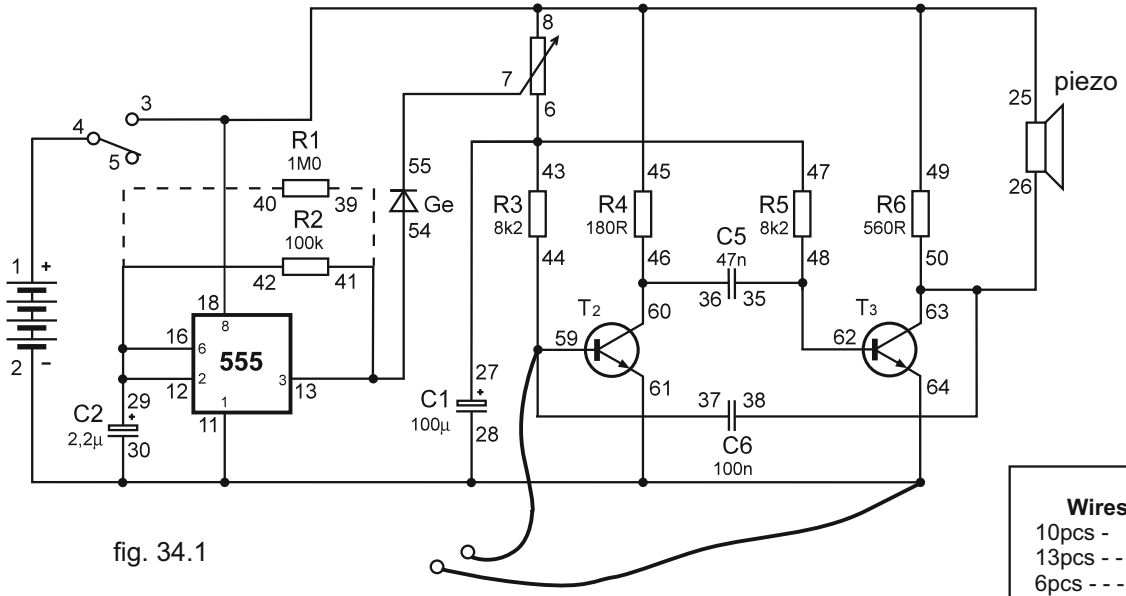



fig. 34.1

**Wires:**
10pcs -
13pcs - -
6pcs - - -

**Wiring guide:**
43 - 47
45 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
61 - - - 2
2 - - - 11
11 - - - 28
28 - 30
27 - - 6
6 - - - 43
1 - 4
3 - - 18
3 - - 8
18 - - - 45
12 - 16
12 - - 29
16 - - 42
13 - - 41
13 - - 54
55 - - - 7
25 - - 49 or 60
26 - - 63
alarm wires:
59, 64

# 35. Light detector with sound signalization

In this connection, we used in an unusual way green LED as a photosensitive element.

Connect model as shown in fig. 35.1 or a "Wiring guide", perform partial control and overall control of connection. Insert the battery, turn on the switch and illuminate the clear LED with some light source (flashlight, table lamp) or move Voltik closer to the window. It would chime a buzzer. After shading the buzzer goes Voltik silent again.

If you place Voltik connected like this and turned on evening to the window, in the morning when daylight touches it, Voltik will beep. In idle (unlit) status this circuit consumes only about 5 mA, so you will not discharge batteries overnight.

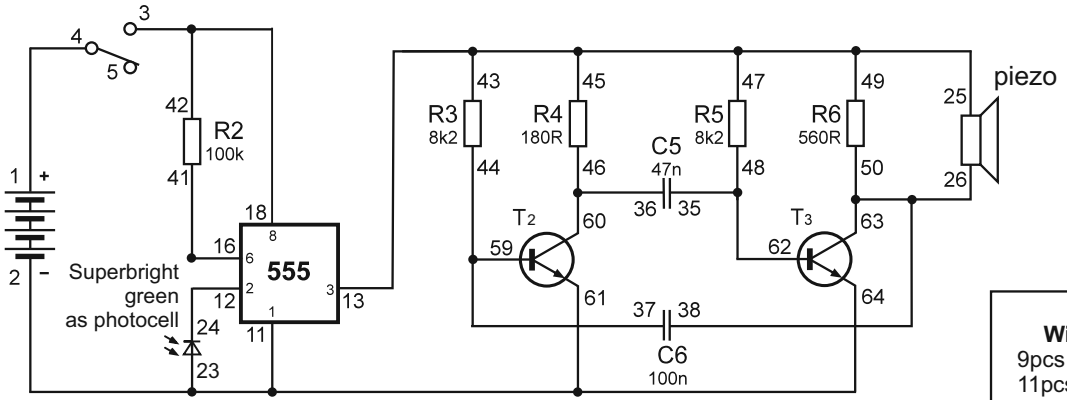



fig. 35.1

**Wires:**
9pcs -
11pcs - -
3pcs - - -

**Wiring guide:**
43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
1 - 4
3 - - 18
18 - - - 42
41 - - 16
2 - - - 61
2 - - - 11
11 - - 23
24 - - 12
13 - - 43
25 - - 49 or 60
63 - - 26

# 36. Target for photo gun

This model is similar to no.35. After light also buzzer will turn on, but unlike in previous connection, beeps even after switching off the lights and stops only after pressing the reset button. By pressing the button the is back in standby mode and the buzzer sounds next time the light is detected. It is essential that when pushing the button LED should be in shade, or the buzzer will sound again after releasing the button.

A similar principle is used in so-called photo shooting range, where instead of shooting bullets gun sends narrow and intense flash of light and if the light beam hits a photosensitive element in the center of the target, buzzer will sound.

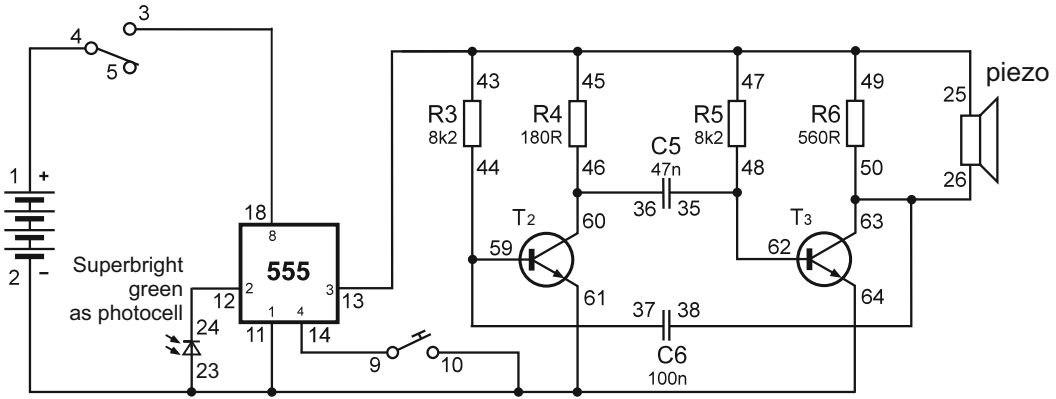



fig. 36.1

**Wires:**
9pcs -
12pcs - -
2pcs - - -

**Wiring guide:**

43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
2 - - - 61
2 - - - 11
11 - - 23
23 - - 10
12 - - 24
1 - 4
3 - -18
14 - - 9
13 - - 43
25 - - 49 or 60
63 - - 26

# 37. Photocell alarm with sound signalization

Device according to Fig. 37.1 again uses sensitivity to ambient light of clear LED. Unlike the models no. 35 and 36 in standby mode, when buzzer should be silent , LED will illuminate with adequate source of light and the buzzer sounds to until interruption of light, which illuminates the LED. Using switch you can then choose whether you want your photocell to beep just in the shade, or to beep continuously even after the momentary shade until it is not back in standby mode.

Connect the circuit according to "Wiring guide" don't forget to partial control after assembly of oscillator and overall control of wiring and wires quality after completing the entire circuit.

Now put the switch to the down position and insert the battery. If you are in the shade, buzzer should beep. Get Voltik closer to the light source (table lamp, flashlight, or a window), so that it falls on the clear LED diode. It should be noted that the LED has an optical lens that focuses light only from a narrow cone (30°), so you need a light source to "point", the buzzer should stop making sound. If you leave the switch in this position, yout protocell will respond to shading with beep and after restoring the lights again falls silent. If you toggle switch in the illuminated state to the up position, buzzer remains silent and sounds permanently to, albeit momentary, shading the LED. The buzzer will stop beeping until the switch is switched down and up again.

Now you can install Voltik jokingly and wait until it starts beeping for example wen opened door or a person cast a shadow on it.

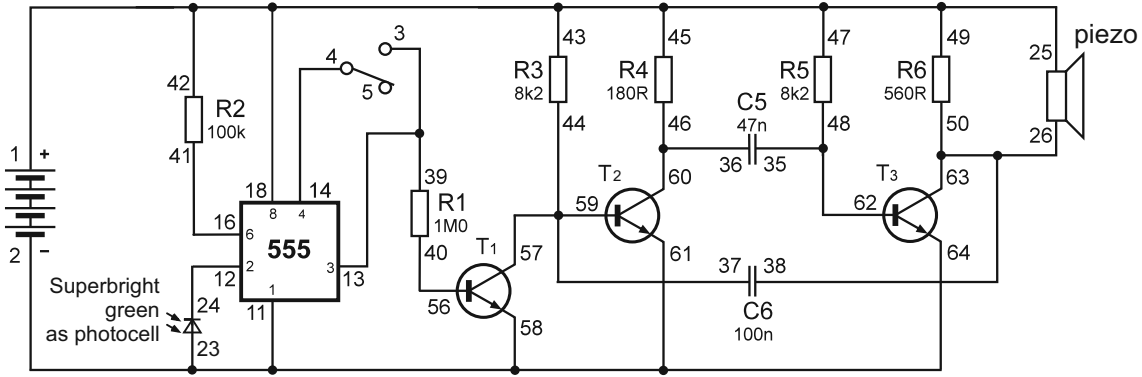



fig. 37.1

**Wires:**
11pcs -
13pcs - -
4pcs - - -

**Wiring guide:**
43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
61 - 58
59 - 57
40 - 56
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
2 - - - 58
2 - - - 11
11 - - 23
12 - - 24
1 - - 18
1 - - - 42
41 - - 16
18 - - 43
13 - - 3
13 - - 39
14 - - - 4
25 - - 49 or 60
63 - - 26

# 38. Soil moisture detector

Connection in Fig. 38.1 allows you to quite accurately check the humidity in a flower pot, a decrease of moisture below the limit set by a potentiometer is signaled by beeping buzzer.

Connect two zinc-plated contact pins (silver color) to the ends of test leads according to Fig. 38.2. After wiring and careful control adjust the potentiometer the middle, insert the battery and turn on the switch up. If the contact points do not touch each other, buzzer beeps. Touch the tips to each other, the buzzer should stop. Now insert the spikes into the soil in the pot, which is watered (if you have just watered, it is necessary to wait a few minutes for the water to seep into the soil throughout the pot), so that the tips have a fixed position and that by turning the potentiometer you can turn on and off the buzzer. Set potentiometer to the position in which the buzzer is just silent. Now you can turn Voltik off. When you want to check moisture of a dirt after some time, turn Voltik on and it starts beeping when the humidity is low already, if there is enough water in the pot, it will remain silent.

If you want your detector to responded at a greater decrease in humidity, turn the potentiometer slightly toward the extreme position "-" (less watered).

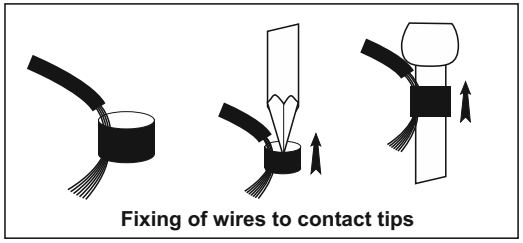



fig. 38.2

**Wires:**
10pcs -
10pcs - -
3pcs - - -

**Wiring guide:**
43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
check wiring
61 - - - 2
2 - - - 11
11 - 7
6 - - 12
16 - - 41
1 - 4
3 - - 18
18 - - - 42
13 - - 43
25 - - 49 or 60
63 - - 26
measuring wires to sockets 3 and 6

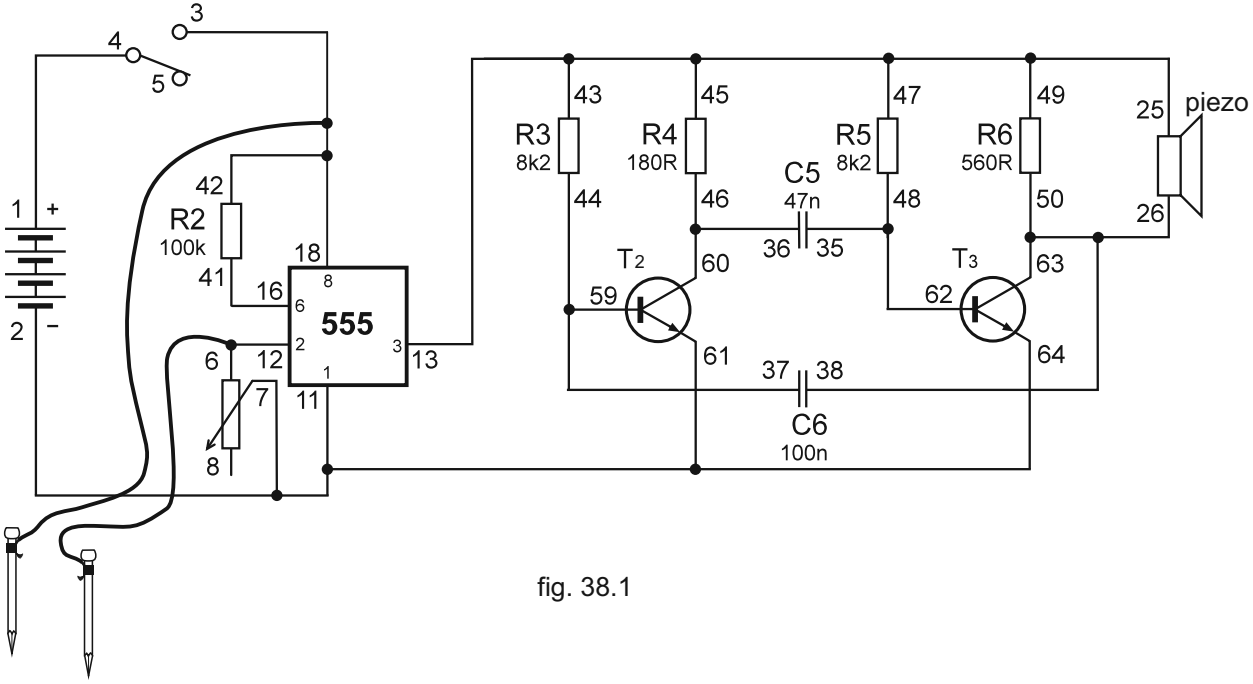

3
4
5
1
+
2
–
42
R2
100k
41
18
8
16
6
555
2
12
1
11
6
7
8
13
43
R3
8k2
44
45
R4
180R
46
47
R5
8k2
48
49
R6
560R
50
C5
47n
36
35
T2
60
59
61
T3
63
62
64
37
38
C6
100n
25
piezo
26

fig. 38.1

# 39. Timer with circuit 555

The circuit as shown in Fig. 39.1 allows you to define the time interval in the range from 10 s to 60 s and from 1.5 min to 10 min. After pressing the button the capacitor C1 100µF instantly charges and with release of the button starts to very slowly discharge through resistor R2 100kΩ. When the capacitor voltage falls below a certain level, it closes the circuit 555 and the buzzer sounds. When using the discharge resistor 100 kΩ, you can by turning the potentiometer set the times between 10-60 seconds. If you use the discharge resistor 1MΩ, it will discharge slower and times will reach between 1.5 and 10 minutes.

Connect the circuit according to the "Wiring guide" and carefully check the quality and accuracy of connections. Insert the battery and turn the switch up, the buzzer starts beeping. Turn the potentiometer to the extreme position "-" and shortly press button. The beeper is silent and sounds again after about ten seconds. If you want to set a longer period of time, turn the potentiometer towards "+". How much time actually elapsed between the moment the button is released and when the buzzer sounds, you can compare with the watch.

However, once you set potentiometer and don't move with it, the time intervals between the button release and automatic ringing a buzzer, you can used it as a regular timer for example for some games..

**Wires:**
10pcs -
16pcs - -
3pcs - - -

**Wiring guide:**
43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
25 - - 49 or 60
63 - - 26
check wiring
61 - - - 2
2 - - - 11
11 - - 28
28 - - - 6
7 - - 15
8 - - 3
3 - - 18
18 - - 9
10 - - 16
16 - 12
12 - - 27
10 - 41
42 - - 64
1 - 4
13 - - 43

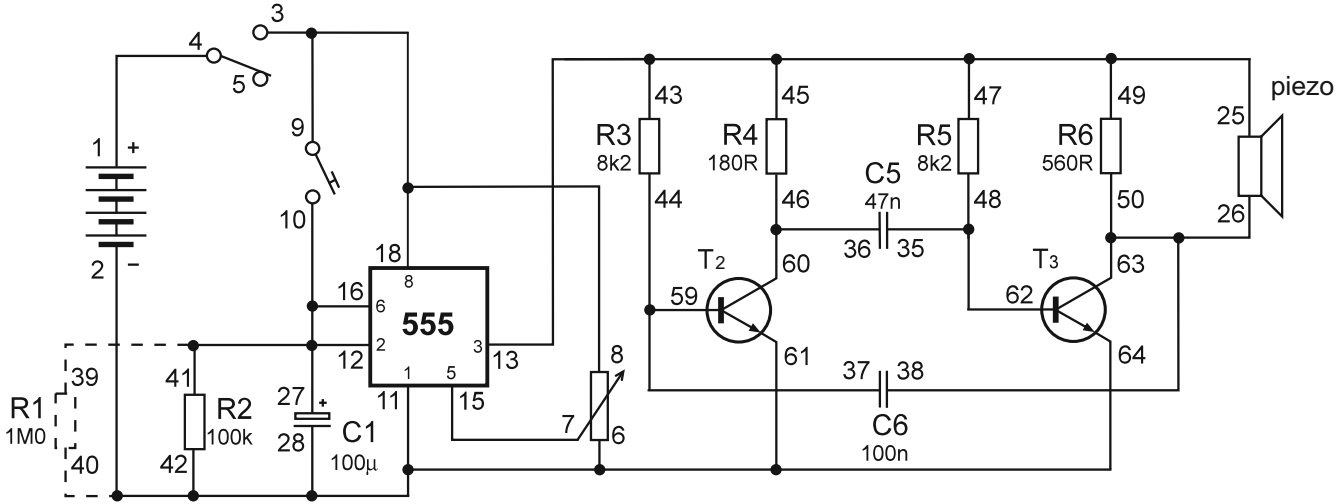

3
4
5
9
10
1
+
2
–
18
8
16
6
555
2
12
3
13
1
5
11
15
R1
1M0
39
40
41
42
R2
100k
27
28
C1
100µ
8
7
6
43
R3
8k2
44
45
R4
180R
46
C5
47n
36
35
47
R5
8k2
48
49
R6
560R
50
25
26
piezo
T2
59
60
61
T3
62
63
64
37
38
C6
100n

fig. 39.1

# 40. Level switch - sensor button

In industry, a similar device has task to watch the water level in the container. If the level reaches a certain height (which could cause overflow), the level switch starts the necessary acoustic signal, or turns off filling of a container. You can build model of this device as shown in Fig. 40.1 or according to "wiring guide". Remember to thoroughly check wiring connections before inserting the battery to the case.

After installing the battery, turn the switch upward and verify operation of the device so that when the probe tips touch the water level in the pot, you hear the buzzer.

It now remains to install the test leads to the inner wall of the tub next to each other so that they do not touch (you can use for sticking the sticker enclosed in the kit). Once when during filling the water touches the electrodes, the buzzer starts beeping.

Note: Be cautious, water must not come into Voltik.

By very simple adjustment on the panel, you can get very sensitive sensor button (only responsive to the touch of your finger). Pull the jumper from 12 - 16, all others must be connected.

Stick the ends of the measuring wires (like to the door frames) close together so that they do not touch, but to be able to touch them both at the same time with one finger. Assembled sensor button responds well to slight touch with whistling buzzer.

**Wires:**
10pcs -
9pcs - -
3pcs - - -

**Wiring guide:**
43 - 45
45 - 47
47 - 49
44 - 59
46 - 60
48 - 62
50 - 63
61 - 64
44 - - 37
46 - - 36
48 - - 35
50 - - 38
25 - - 49 or 60
63 - - 26
check wiring
1 - 4
3 - - 18
18 - - - 42
2 - - - 11
2 - - - 61
16 - 12
16 - - 41
13 - - 43
measuring wires
to sockets 12 and 11

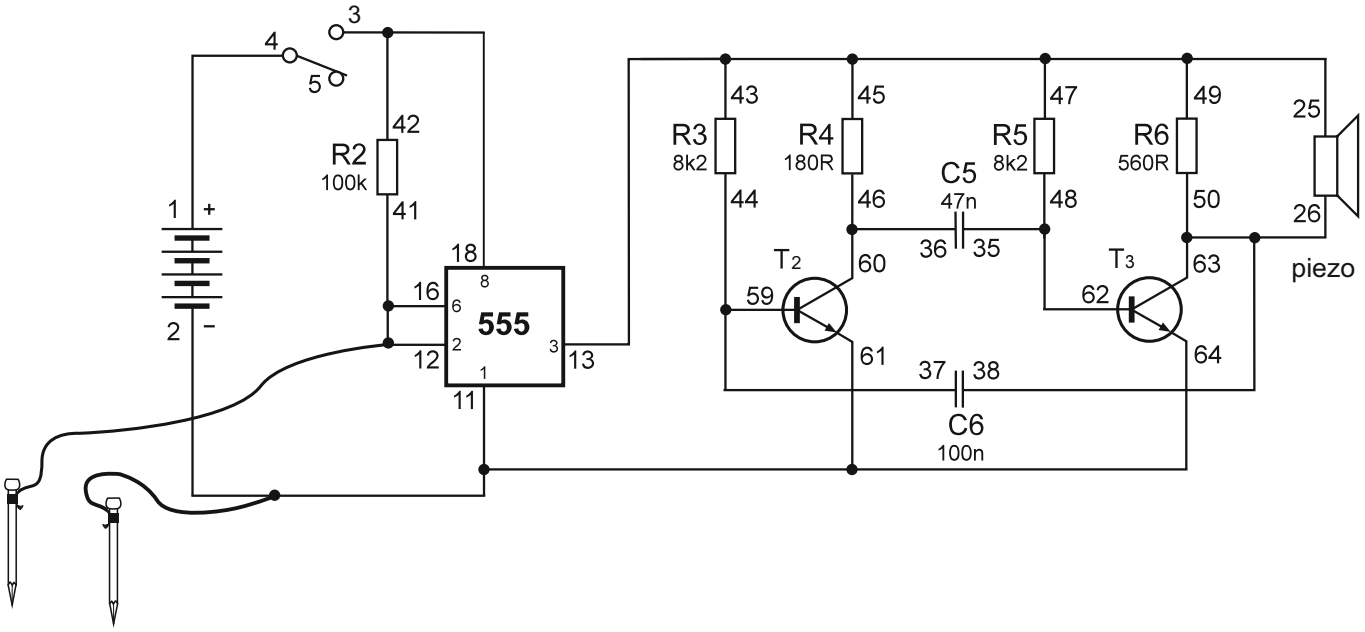

3
4
5
42
R2
100k
41
1
+
2
–
18
8
16
6
555
2
12
1
11
3
13
43
R3
8k2
44
45
R4
180R
46
47
R5
8k2
48
49
R6
560R
50
25
26
piezo
C5
47n
36
35
T2
60
59
61
T3
63
62
64
37
38
C6
100n

fig. 40.1

# 41. Sensitive noise detector

The present device is also able to register a slight noise in the room or voice. If the noise around this connected Voltik exceeds the preset limit, the red and green LEDs shines and remain illuminated until you press button and reset device to standby.

Build the circuit according to the "Wiring guide", carefully check the correctness of connections (including partial control after the connection of transistor amplifier) and insert the battery. Turn the switch up - the red and green LED shines. Turn the potentiometer fully to the extreme position marked "-", lay Voltik on the table and silently touch the button. Light should go off. In case that it remains lit, it is necessary to put the Voltik for example next to the a table lamp, which has stronger surrounding electromagnetic field. (Explanation and experiment in model No. 14).

Clap and lights should light up again. Now you can gently roll the slider to the extreme position "+" and gradually increase the sensitivity of the device to a weak noise, to the point where it is still possible to touch a button and LED to go out.

**Wiring guide:**

58 - 61
61 - 64
57 - 59
60 - 62
63 - 46
60 - 48
57 - - 50
46 - - 39
40 - 56
45 - 47
check wiring
40 - - 25
58 - - 26
49 - - - 7
6 - - 3
4 - 1
6 - 18
11 - - - 2
2 - - - 26
45 - - - 18
64 - - - 28
47 - - - 27
39 - - 16
3 - - - 19
20 - 23
24 - - 17
12 - 9
11 - - 10

**Wires:**

12pcs -
8pcs - -
7pcs - - -

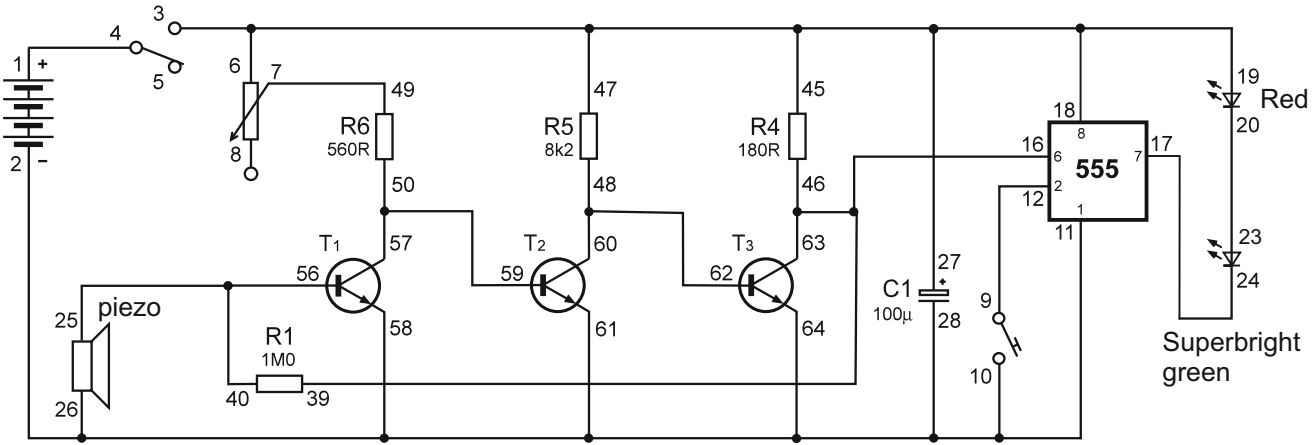

1
+
2
-
3
4
5
6
7
8
R6
560R
49
50
R5
8k2
47
48
R4
180R
45
46
T1
57
56
58
T2
60
59
61
T3
63
62
64
piezo
25
26
R1
1M0
40
39
C1
100µ
27
28
9
10
18
8
16
6
2
12
1
11
555
7
17
19
Red
20
23
24
Superbright
green

fig. 41.1

# 42. Wireless colorful music

Model as shown in fig. 42.1 responds to the ambient sound by flashing of red and green lights. If you turn on a radio playing music nearby this model, lights will blink rhythmically to the music.

Colorful music is used in discos to augment musical experience and is usually characterized by multiple lights (of course, much stronger than your LED diode). The lights then react (independently) to high, medium or low notes of music.

Your colorful music will have the advantage that it is not necessary to connect it to anything, because it uses built-in speaker as a microphone to capture ambient sounds.

Connect the circuit according to the "Wiring guide" (not recommended to connect differently because other connections and wires could cause vibrations in circuit and its wrong function). After carefully checking the wiring you can insert the battery and turn on the switch up. By turning of the potentiometer you can make lights to respond to ambient noise.

If your device is working, you can turn on the radio, place Voltik near a radio, adjust the sensitivity using the potentiometer or the volume so that lights flickers to the music. The effect is obviously better when it is dark in the room.

**Wires:**

11pcs -
11pcs - -
7pcs - - -

**Wiring guide:**

58 - 61
61 - 64
57 - 59
60 - 62
63 - 46
60 - 48
59 - - 50
46 - - 39
40 - 56
45 - 47
check wiring
1 - 4
3 - - 6
6 - 18
18 - - - 45
3 - - - 19
19 - - 41
7 - - - 49
2 - - - 11
2 - - - 64
28 - - - 64
16 - - 42
12 - - 39
20 - 23
24 - - 17
25 - - 40
26 - - 58
36 - - 56
35 - - 57
27 - - - 47

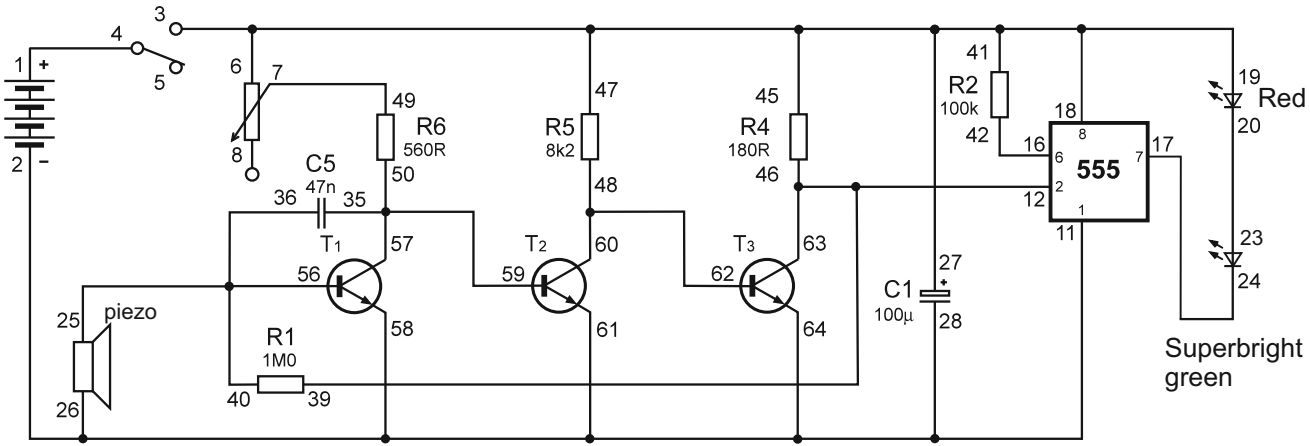

1
+
2
-
3
4
5
6
7
8
R6
560R
49
50
C5
47n
36
35
T1
57
56
58
R1
1M0
40
39
25
piezo
26
R5
8k2
47
48
T2
60
59
61
R4
180R
45
46
T3
63
62
64
41
R2
100k
42
C1
100µ
27
28
18
8
16
6
555
7
17
2
12
1
11
19
Red
20
23
24
Superbright
green

fig. 42.1

# 43. Wireless alarm

This device responds to the disconnection of contacts of alarm with sound signal, but unlike the model no. 19, transmits an alarm signal in the form of radio waves, which can be received on conventional radios on AM range 450 to 1600 kHz (medium waves).

Both Voltik and the radio tune to the same frequency and in the event of a disconnection of alarm contacts you will hear beeps on the radio. If you ground Voltik, or connect the anetenna (see below), you capture an alarm on the radio certainly throughout whole your home.

Connect the model according to the "Wiring guide" and carefully check the accuracy and quality ofconnections. If everything is in order, the "revival" of the device is simple: Turn on the radio and tune it so that it you do not hear any station (or poorly). Place Voltik to max. 2 m from radios, insert the battery and turn the switch up, keep the ends of the alarm wires apart. Now, by carefully sliding the ferrite core in the coil tune the frequency of the transmitter of Voltik to radio frequency. You'll know it by loud whistling in the radio, which increases or decreases according to the movement of the core in the coil. If you find multiple positions of ferrite core in the coil, at which the radio responds, choose the loudest one. Now you can install Voltik. Place the alarm wires by your own imagination (on the desk drawer, door, you can load them with the guarded object - even Voltik). The distance at which you can receive alarm signal at home depends on several factors, but primarily on the sensitivity and accuracy of radio and tuning of ferrite core in the coil. If the signal from your alarm on the radio is poor, connect an antenna or ground, or both sockets 51 and 53 according to the scheme. Use for this purpose longest wires contained in the kit.

After connecting an antenna or ground the transmitter detunes, and it needs to be fine-tuned by ferrite core to the highest volume on the radio. For the sake of completeness - terminal is connected to the metal central heating or water pipe.

**Wires:**
5pcs -
11pcs - -
6pcs - - -

**Wiring guide:**
1 - 4
3 - - 18
18 - - - 49
3 - - 27
17 - - - 50
50 - - 41
41 - - - 52
35 - - 12
12 - 16
16 - - 43
2 - - 28
28 - - - 11
11 - - 36
2 - - - 61
13 - - 44
51 - - 33
33 - 31
32 - - 59
59 - 42
34 - - 53
53 - - - 45
46 - 60
ground 51
antenna 53
alarm wires:
2, 14

By simple adjustment you get a wireless level switch, which will guard bathtub filling with water. Therefore disconnect the wire 13 - - 44, fix test leads into sockets 44 and 13. Fasten contact pins to the to the test leads according to in Fig. 38.2 and fasten these using adhesive tape on the inner wall of the tub so that they do not touch. Once the water reaches them, radio will make a sound. More water there is, higher tone there is coming from the radio.

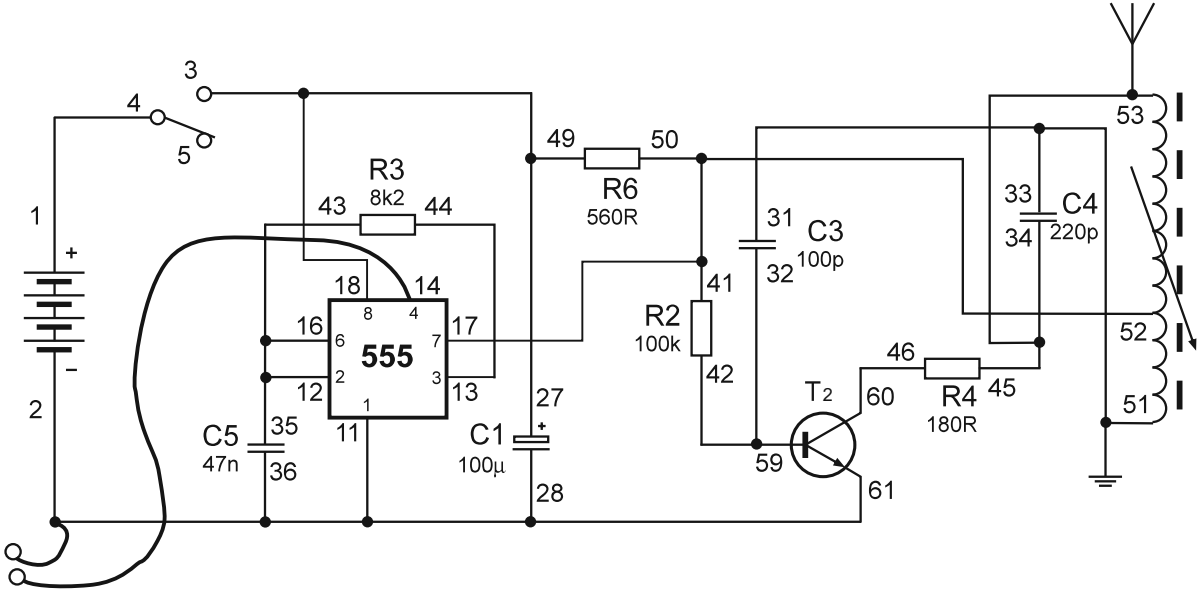



fig. 43.1

# 44. Wireless acoustic photocell

The assembled device responds to shading of light sensor (green LED) like photocell according to instructions no. 37 by buzzer, but contains additional radio transmitter that can be received on a regular radios in AM 450-1600 kHz (medium waves). Voltik therefore can be installed in one room and you listen to the alarm in radios in the other room, without the need for several meters of wires.

Connect carefully the circuit according to the "Wiring guide" (the circuit is quite complicated, therefore continually check of the joints). Insert the battery and turn the switch up. Turn the potentiometer completely to the extreme position "+" and shade the clear LED, buzzer should make a sound. Now Illuminate LED by for example table lamp, you can also point Voltik point to the window - the buzzer should stop. If this device responds to the light, everything is fine. You can experimentally adjust the sensitivity of photocell by potentiometer to smaller lighting (partial turn towards an extreme position "-"). However, try to illuminate the photocell as much as possible, it will work reliably.

Now you need to establish radio communication between photocell and radio, with which you observe alarm. Pull the jumper to the speaker (26 - - - 13) to stop buzzer disturbing you when tuning. Turn the radio to medium waves (AM 450-1600 kHz), and detune it, so you don't hear any station (or poorly). The radio will now make noise, which is still status, when the photocell is lit and does not transmit an alarm signal.

| | |
|---|---|
| **Wires:** | 13 - - 44 |
| 9pcs - | 23 - - - 59 |
| 16pcs - - | 29 - - - 61 |
| 9pcs - - - | 61 - 62 |
| | 31 - 33 |
| **Wiring guide:** | 33 - - 51 |
| | 34 - - 53 |
| | 53 - - - 45 |
| 1 - 4 | 32 - - 56 |
| 3 - - 18 | 56 - 42 |
| 18 - - - 47 | 46 - 57 |
| 47 - - 24 | antenna 53 |
| 24 - - 25 | grounding 51 |
| 25 - - 49 | |
| 6 - - - 60 | |
| 60 - 63 | |
| 63 - 48 | |
| 7 - - 14 | |
| 8 - 11 | |
| 11 - - 36 | |
| 36 - - 2 | |
| 2 - - - 64 | |
| 64 - - 58 | |
| 64 - - - 30 | |
| 17 - - - 50 | |
| 50 - - 41 | |
| 41 - - - 52 | |
| 35 - - 12 | |
| 12 - 16 | |
| 16 - - 43 | |
| (26 - - 13) | |

Place Voltik to max. 2 m from radio and shade the light sensor (clear LED). By moving the ferrite rod in coil tune transmitter of Voltik so that in the radio is loud beeping, instead of noise. Its intensity is dependent on the movement of the ferrite rod. This will look like an alarm signal from the photocell, when there is shadow on it. Ferrite rods leave in place where the signal is strongest on the radio, once again illuminate the LED, whistling in a radio should stop. If your photocell works this way, you can install it at the appropriate place and adequately illuminate it. Photocell will react by beeping in the radio when someone walks past it and overshadow it.

If there is no signal on the radio, at a greater distance, strong enough, connect the antenna and the ground as shown in fig. 44.1. After connecting of an antenna or grounding it is necessary to always tune transmitter.

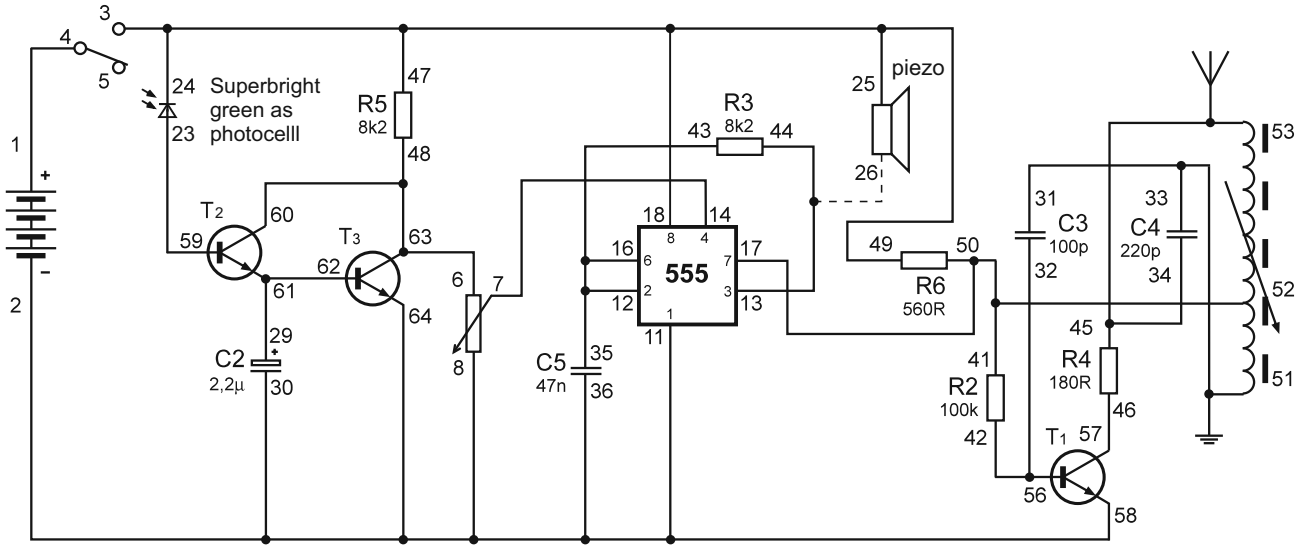



fig. 44.1

# 45. Grip meter

A simple electronic model as shown in Fig. 45.1 using integrated circuit "555" will certainly provide a lot of fun. It is able to oscillate in a very wide range from hum to barely audible high tone depending on the resistance, which is the measurement between the free ends of test wires. You can connect the wires to the ends of galvanized electrodes (silver color), which are included in the kit and then you grab to hands and press. According to strength of your grip tone varies - bigger the push, the less resistance of your body and also higher tone. It is also possible to put one electrode into the hand of a friend, the other you can keep in your hand and grab together your other hands. The stronger the grip of your hands, the higher the tone. When placing the electrodes into the vessel filled with water, the buzzer starts to beep when the electrode touches the water, and the tone is increased, deeper the electrodes are immersed in water. It is also possible to place the electrodes on the windowsill next to each other and when it starts to rain, Voltik begins to beep. Surely you can think of plenty of other uses of this practical connection. If you are not satisfied with the tone range, you can replace C5 - 47n with C6 - 100n or parallel or serial combination of both capacitors. When capacitors are connected in parallel (side by side), the total capacity is the sum of connected capacity - total capacity is higher and buzzer frequency is generally reduced. With a serial connection the resulting capacity is lower than the capacity of the smallest capacitor and buzzer frequency is increased overall.

It is of course possible to use other capacitors - you can experiment. If you connect electrolytic capacitors C1 and C2, make sure the "-" terminal of the capacitor is connected to the "-" pole of the battery (over socket 11).

**Wires:**

3pcs -
6pcs - -
1pcs - - -
2pcs - - - -

**Wiring guide:**

1 - 4
3 - - 18
18 - - 25
25 - - 46
17 - - 26
26 - 45
16 - 12
12 - - 35
11 - - - 2
11 - - 36
13 - - - - tip
16 - - - - tip

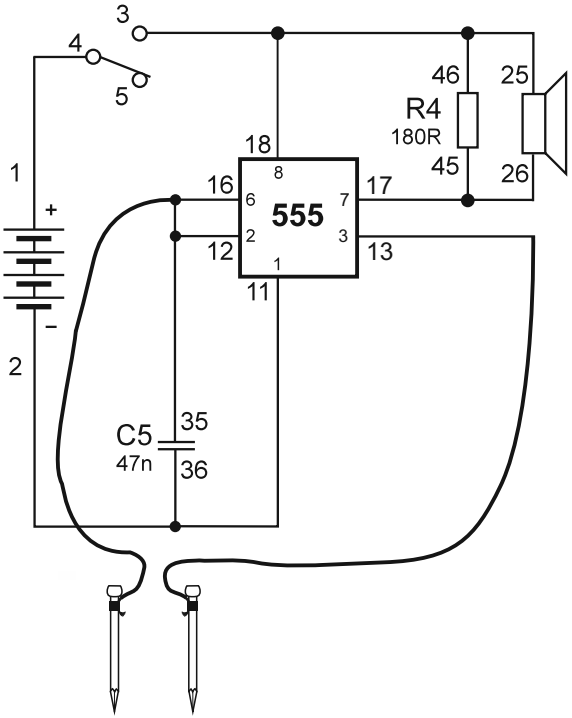



fig. 45.1

# 46. Switching the light on and off by one button

After assembling the circuit will behave like a push-button switch, for example on the television, at one button press the circuit "555" turns on - red LED lights up, at next button pressed, the circuit shuts down - LED goes out.

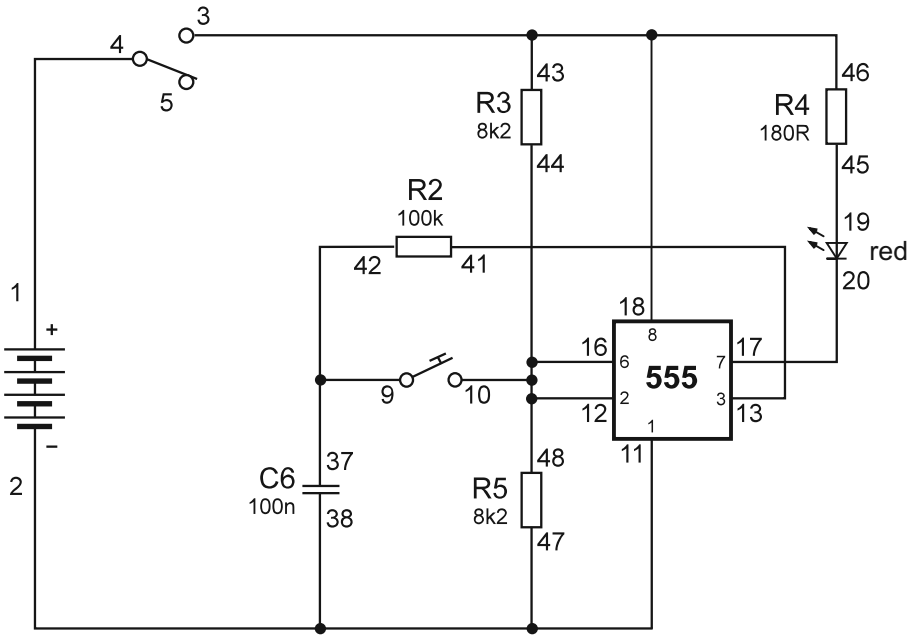



fig. 46.1

**Wires:**
5pcs -
10pcs - -
1pcs - - -

**Wiring guide:**

1 - 4
3 - - 18
18 - - 43
43 - 46
2 - - - 11
11 - - 38
38 - - 47
10 - - 16
16 - 12
12 - - 44
44 - 48
9 - 37
37 - - 42
13 - - 41
17 - - 20
19 - - 45

# 47. Transmitter - receiver of Morse code

With this model you can connect Voltik II. with Voltik I. or another Voltik II. and create a telegraphic connection to receive and transmit Morse code. You transmit Morse code using a button, with switch you select whether you want to receive the signal in the form of buzzer sounds or flashing red LED. If the second station is Voltik II., connect it the same way. If the second station is Voltik I., connect it according to the instructions of the model no.30 from manual for Voltik I. If you want to tune the tone pitch at the buzzer of Voltik II., connect instead of the resistance R3 potentiometer (sockets 6 and 7) and connect the capacitor C5 instead of capacitor C6.

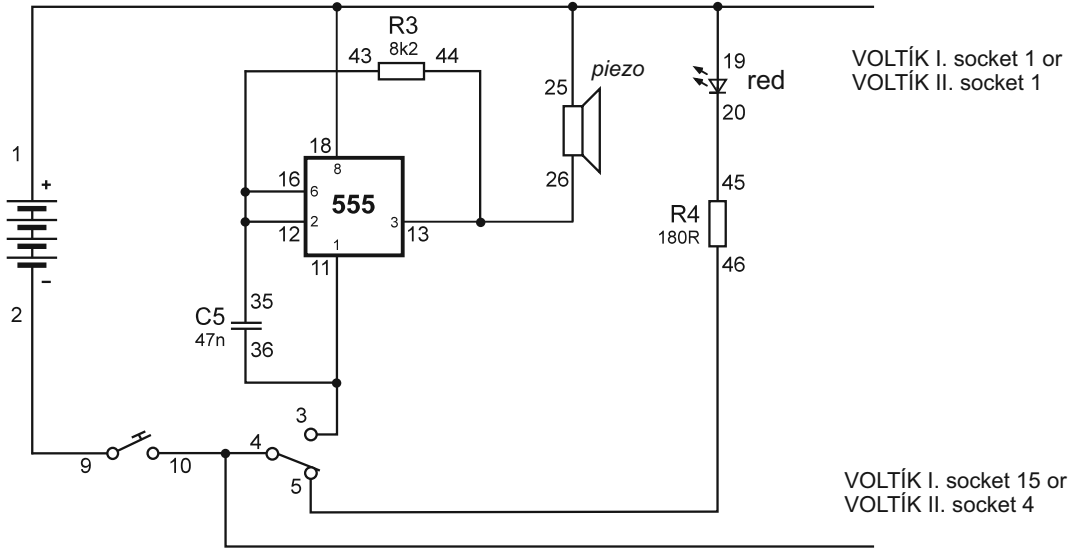



fig. 47.1

**Wires:**
1pc -
10pcs - -
3pcs - - -

**Wiring guide:**

1 - - 18
18 - - 19
19 - - 25
20 - - 45
46 - - - 5
4 - - - 10
3 - - 11
11 - - 36
35 - - 12
12 - 16
16 - - 43
44 - - 13
13 - - 26
9 - - - 2

# 48. Alarm honker with Voltík I.

This model can work only in conjunction with Voltik I. It represents the horn with which it is possible to change the tone pitch on the panel Voltik I and honk speed by potentiometer on the panel of Voltik I.

First, prepare Voltik I. (you do not need to put in more batteries, power is supplied completely by Voltik II). On the Voltik I. connect these sockets: 2 - 22, 18 - 21, 19 - 23. Now connect Voltik II. according to the diagram or a "Wiring guide" and connect it to Voltik I. using 3 long conductors (size 4) as follows:

Voltik II socket 2 - - - - Voltik I. socket 2
Voltik II socket 13 - - - - Voltik I. socket 18
Voltik II socket 27 - - - - Voltik I. socket 23

After turning on the power switch on the panel of oltik II., Voltik I. begins to intermittently hoot, so that the tone always rises and shuts down. Speed of interruptions can be adjusted by potentiometer on Voltik II. If you want to reduce the overall rate of interruptions, connect instead of timing resistor R2 100k resistor R1 1M0.

You can increase speed by connecting of resistor R3 or R5 8k2 or serial or parallel combinations of both. When you remove connection between Voltik II. socket 27 and Voltik I. socket 23, the tone will sound intermittently without moving rise.

Now it's up to your imagination what sounds are to be heard out of your horn.

**Wires:**
3pcs -
8pcs - -
1pc - - -
3pcs - - - -

**Wiring guide:**
1 - 4
3 - - 18
18 - - 8
2 - - - 11
11 - - 6
2 - - 28
28 - 30
29 - - 12
12 - 16
16 - - 41
7 - - 15
13 - - 42
VII.2 - - - - VI. 2
VII. 13 - - - - VI.18
VII. 27 - - - - VI. 23

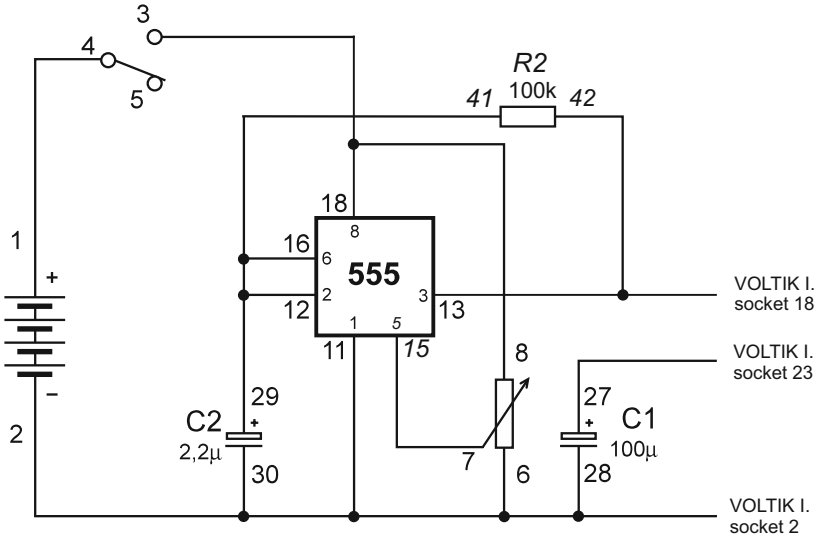

3
4
5
R2
41
100k
42
18
8
16
6
555
2
3
12
1
5
13
11
15
1
+
–
2
8
29
C2
2,2µ
30
7
6
27
C1
100µ
28
VOLTIK I.
socket 18
VOLTIK I.
socket 23
VOLTIK I.
socket 2

fig. 48.1

# 49. Modulator for Voltík I.

This model is only operable with Voltik I. Both kits connected as shown in Fig. 49.1 makes a tone generator capable of making sounds.

First connect Voltik I. by the following guide: 2-22, 23-C2 20-21, 18-24 or C1 to C2. You do not have to put in the battery, as the whole set is powered by Voltik II.

Connect according to "Wiring guide" Voltik II and connect both Voltiks with four wires size 4 follows:

Voltik II socket 2 - - - - Voltik I socket 2
Voltik II socket 29 - - - - Voltik I socket 23
Voltik II socket 17 - - - - Voltik I. socket 19
Voltik II socket 3 - - - - Voltik I. socket 21

If you have checked connection, set potentiometers of both Voltiks approximately to the center, insert the battery and turn on the power switch up. There should be no sound yet, only after pressing some keys C1 to C2 on Voltik I. you will hear a tone, and it should periodically wobble. Wobble rate can be changed using the potentiometer on Voltik II and depth of wobble by potentiometer on Voltik I. If your kit works without error, you can start to make all the sounds you can imagine.

Always one of the two potentiometers set to a certain position, turn with second one and press the keys on Voltik I. You can get fancy sounds, if you set the wobble depth to a minimum when tone wobble is still heard and set an appropriate rate speed of wobble. This will give you effect, otherwise also called "Vibrato". Once you run out of all options, try to swap the ends of the wires mounted in sockets 27 and 29 or replace potentiometer with some solid resistance etc. In place of the capacitors C1 and C2 you can be alternate all capacitors available in the kit. You can try to substitute a potentiometer with any other resistor from a kit.

**Wires:**
3pcs -
5pcs - -
1pc - - -

**Wiring guide:**

1 - 4
3 - - 18
7 - - 16
16 - 12
12 - - 27
2 - - 28
28 - 30
2 - - - 11
6 - - 13

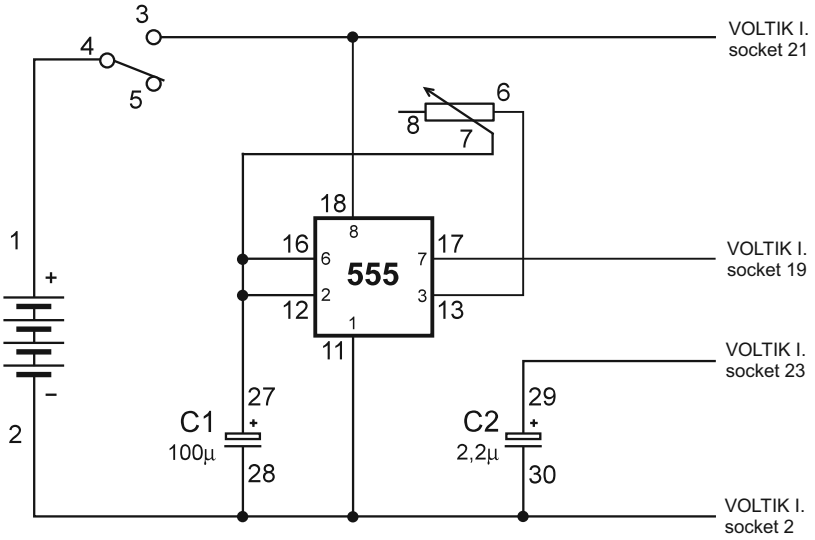

3
4
5
6
8
7
18
8
16
6
555
7
17
2
3
12
13
1
11
1
+
–
2
C1
100µ
27
28
C2
2,2µ
29
30
VOLTIK I.
socket 21
VOLTIK I.
socket 19
VOLTIK I.
socket 23
VOLTIK I.
socket 2

fig. 49.1

# 50. Lottery "Head - tails"

After assembling of the circuit, insert the battery into the case and turn on the switch to light up one of the two LEDs (red or green). Press and hold the button now - both LEDs light weakly - now there is draw. When the button is released, the light stays on one of the two LEDs and this is the result of the draw.

From the principle of connection implies that it is impossible to influence the outcome of the draw and by an experiment, we found that the probability of one or the other color (already at 100 attempts) is almost the same.

**Wires:**

5pcs -
11pcs - -
3pcs - - -

**Wiring guide:**

1 - 4
3 - - 18
18 - - 43
43 - 46
2 - - - 11
11 - - 38
38 - - 50
17 - - - 44
44 - 48
48 - - 54
9 - - 47
47 - - - 55
10 - - 16
16 - 12
12 - - 37
13 - - 20
20 - 23
19 - - 45
24 - - 49

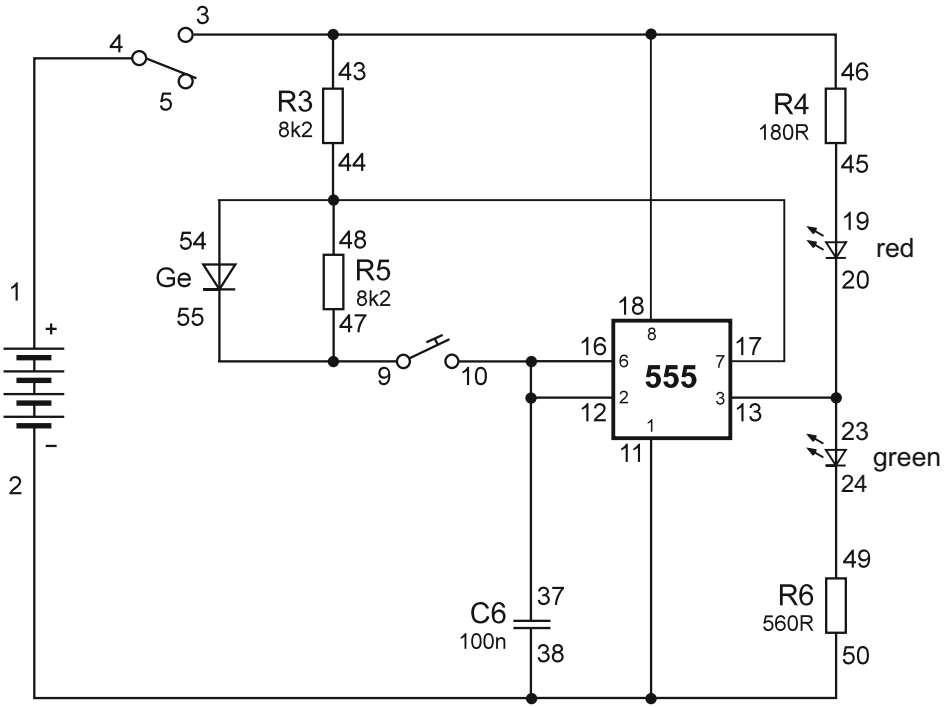

3
4
5
43
R3
8k2
44
46
R4
180R
45
19
red
20
54
Ge
55
48
R5
8k2
47
1
+
2
-
18
8
16
6
555
7
17
2
12
1
11
3
13
9
10
23
green
24
49
R6
560R
50
37
C6
100n
38

fig. 50.1

# ”SOMETHING MORE” - Electricity from lemons

For some of you this may be a small miracle, but it is only practical use of physics and chemistry. For this experiment you will not need batteries. You will light up LED through an electrochemical reaction that takes place in lemons.

Procedure:

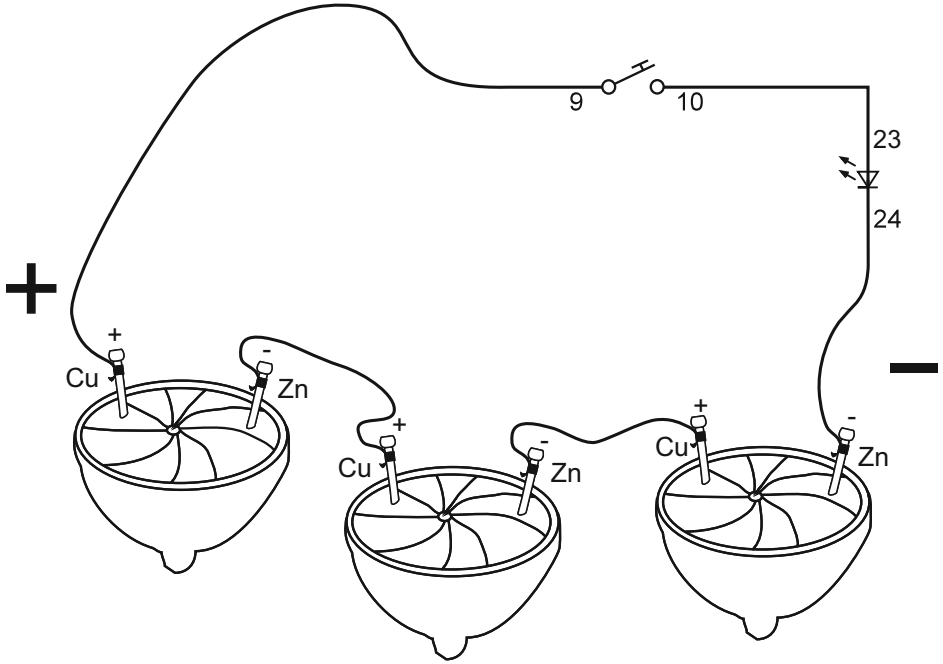
- Without lemons connect zinc (Zn) electrodes (silvercolor) and copper (Cu) electrodes (brownish red color) using the wires as shown below.
- Stick electrodes into thelemons according to the picture so that they do not touch each other inside. The deeper the better. The greater the surface area of the electrode participating in the reaction, the more light from the LED. Work with the lemons carefully and separate them completely from Voltik because the acid from lemons might damage it.
- Connect battery made of three cells using the long wires to Voltik (polarity is important - to the copper electrode is positive (+) on the zinc electrode negative (-)).

If everything is properly connected, the lights now, after pressing, shines weakly.

Note: Chemical reaction slowly dissolves zinc electrode surface. So do not have electrodes stuck in the lemon for too long and always rinse them and wipe dry after the experiment. Lemons are, of course, after this experiment INEDIBLE!

**Wiring guide:**

10 - - 23
Cu - - - - 9
Zn - - - - 24


9
10
23
24
+
-
Cu
Zn
+
-
Cu
Zn
+
-
Cu
Zn

# List of components

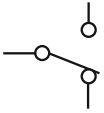
| | | | |
|---|---|---|---|
| Resistors | | R1, R2, R3, R4, R5, R6 1M0, 100k, 8k2, 180R, 8k2, 560R (0,25 W, 5%) | |
| Capacitors | C1, C2, C3, C4, C5, C6 | electrolyte: 100$\mu$/25V, 2,2$\mu$/100V, ceramic: 100p, 220p, 47n, 100n | |
| Potentiometer | | 10 k/N | |
| Transistors | | T1, T2, T3 BC 547C | |
| LEDs: red, yellow, green | | L53HD, L51YD, L53SGC (100-300 mcd at 20mA - "superbright green") | |
| Piezo - speaker | | PE3110W | |
| Germanium diode | " Ge " | 1N34A | |
| Integrated circuit "555" | | NE 555 | Caution, soldered upside down. |
| Coil | | 40 + 60 turns of Cu 0,15 mm wire | |
| Ferrite core | | 8x60 mm, material H11 | CAUTION, FRAGILE! |
| Connecting wires | | LIYv 0,25 | |

# Electronic symbols used in VOLTÍK II kit.

Trace crossing

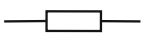
trace junction

button switch

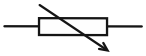


switch

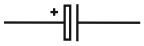

battery - source of electrical voltage



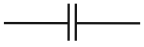
electric resistance



potentiometer




electrolytic capacitor



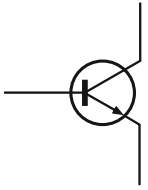
ceramic capacitor

LED

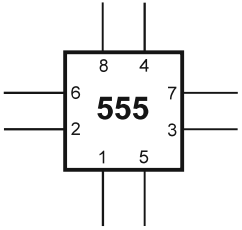
photocell

germanium diode

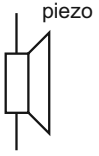
Ge



transistor




integrated circuit 555




piezo speaker

tunable coil with ferrite core

# Contents

Ing. Ivan Svoboda
RNDr. Radka Svobodová

# VOLTIK I. - Guide for construction kit

expert review - Mgr. František Novosad

SVOBODA, Ostrava - Petřkovice
1997

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