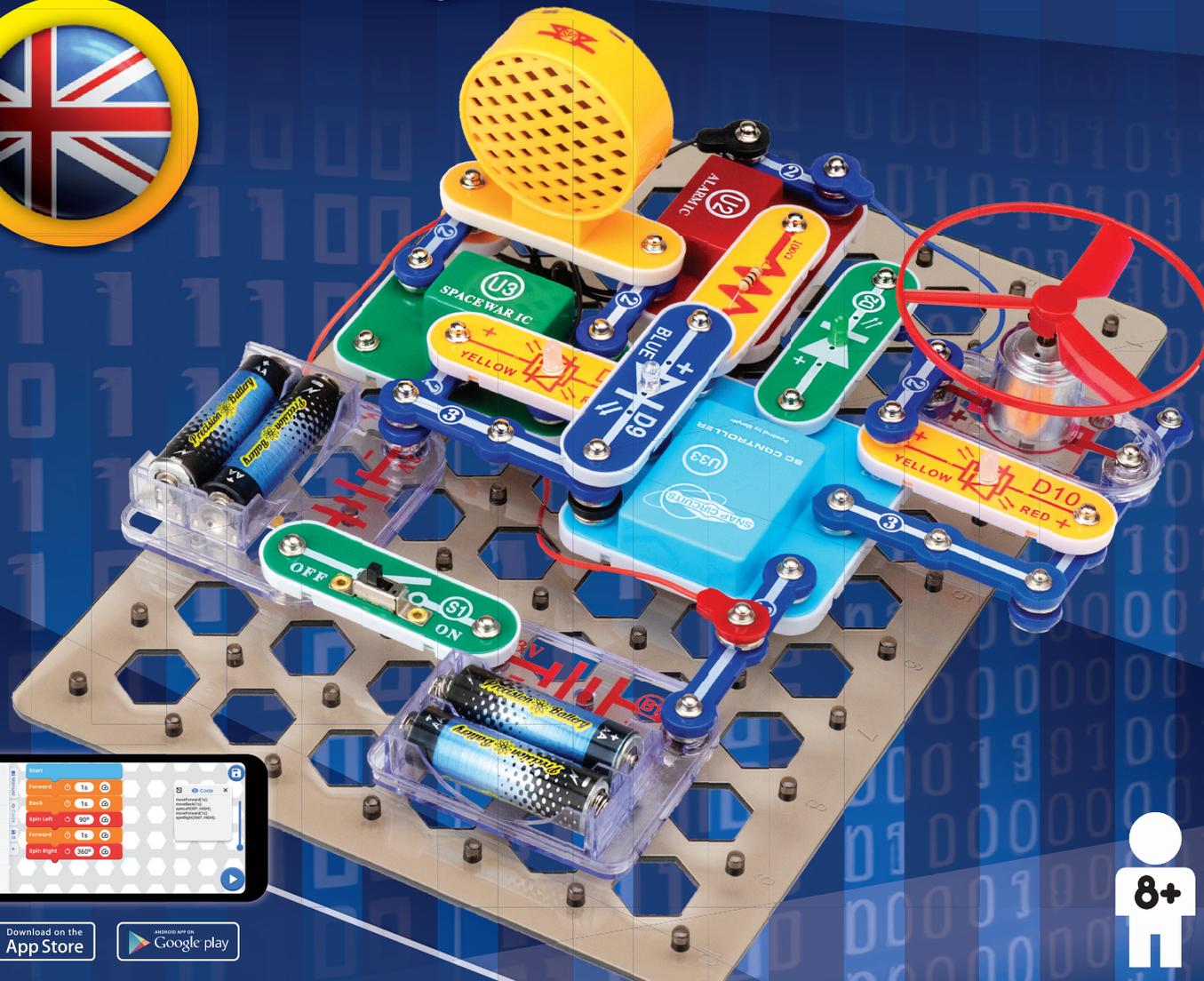


Electronic kit

Elektronická stavebnice
Elektronická stavebnice

Zestaw elektroniczny
Elektronikus építőkészlet

BOFFIN IV CODING 2



Learn to programme
with Boffin kit and app

Nauč se programovat
se stavebnicí
a aplikací Boffin

Nauč sa programovať
so stavebnicou
a aplikáciou Boffin

Naucz się programować
za pomocą zestawu
i aplikacji Boffin

Tanuljon meg programozni
a Boffin készlettel
és alkalmazással



Table of Contents

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WARNING: FOR ALL PROJECTS WITH A SYMBOL 

 - Moving parts do not touch the motor or fan during operation. Do not lean over the motor. Do not launch the fan at people, animals, or objects. Eye protection is recommended.

WARNING: SHOCK HAZARD - Never connect Boffin to electrical outlets in your home in any way!



WARNING: CHOKING HAZARD - Small parts. Not for children under 3 years.



Flash frequency
WARNING: This toy produces flashes that may trigger epilepsy in sensitised individuals. Only for use by children aged 8 years and older. Not suitable for children and under 8 years due to small parts which could cause a choking hazard.

over 8 years

Conforms to all applicable EU sales requirements.

Basic Troubleshooting

1. Most circuit problems are due to incorrect assembly, always double-check that your circuit exactly matches the drawing for it.
 2. Be sure that parts with positive/negative markings are positioned as per the drawing.
 3. Be sure that all connections are securely snapped.
 4. Try replacing the batteries.
- Conquest ent. is not responsible for parts damaged due to incorrect wiring.**

Note: If you suspect you have damaged parts, you can follow the Advanced Troubleshooting procedure on page 5 to determine which ones need replacing.

WARNING: Always check your wiring before turning on a circuit. Never leave a circuit unattended while the batteries are installed. Never connect additional batteries or any other power sources to your circuits. Discard any cracked or broken parts.

Adult Supervision:
 Because children's abilities vary so much, even with age groups, adults should exercise discretion as to which experiments are suitable and safe (the instructions should enable supervising adults to establish the experiment's suitability for the child). Make sure your child reads and follows all of the relevant instructions and safety procedures, and keeps them at hand for reference.

This product is intended for use by adults and children who have attained sufficient maturity to read and follow directions and warnings.

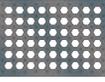
Never modify your parts, as doing so may disable important safety features in them, and could put your child at risk of injury.

! Batteries:

- Use only 1.5V AA type, alkaline batteries (not included).
- Insert batteries with correct polarity.
- Non-rechargeable batteries should not be recharged. Rechargeable batteries should only be charged under adult supervision, and should not be recharged while in the product.
- Do not mix old and new batteries.
- Do not connect batteries or battery holders in parallel.
- Do not mix alkaline, standard (carbon- zinc), or rechargeable (nickel-cadmium) batteries.
- Remove batteries when they are used up.
- Do not short circuit the battery terminals.
- Never throw batteries in a fire or attempt to open its outer casing.
- Batteries are harmful if swallowed, so keep away from small children.
- When installing a battery, be sure the spring is compressed straight back, and not bent up, down, or to one side.
- Battery installation should be supervised by an adult.

Parts List (Colors and styles may vary) Symbols and Numbers

Important: If any parts are missing or damaged, **DO NOT RETURN TO RETAILER.** Contact us at: info@boffin.cz.
You may order replacement parts at www.toy.cz

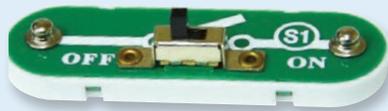
| Qty. | ID | Name | Symbol | Part | Qty. | ID | Name | Symbol | Part |
|------|-----|---|---|---------|------|-----|-------------------|---|--------|
| ☐ 3 | ① | 1- Snap Wire |  | 6SC01 | ☐ 1 | | Jumper Wire, Red |  | 6SCJ2 |
| ☐ 6 | ② | 2 - Snap Wire |  | 6SC02 | ☐ 1 | | Jumper Wire, Blue |  | 6SCJ4 |
| ☐ 3 | ③ | 3 - Snap Wire |  | 6SC03 | ☐ 1 | Ⓜ1 | Motor |  | 6SCM1 |
| ☐ 1 | ④ | 4 - Snap Wire |  | 6SC04 | ☐ 1 | | Fan |  | 6SCM1F |
| ☐ 1 | ⑤ | 5 - Snap Wire |  | 6SC05 | ☐ 1 | Ⓚ2 | NPN transistor |  | 6SCQ2 |
| ☐ 1 | ⑥ | 6 - Snap Wire |  | 6SC06 | ☐ 1 | Ⓡ1 | 100Ω Resistor |  | 6SCR1 |
| ☐ 2 | Ⓚ1 | Battery Holder - uses two (2) 1.5V type "AA" (not Included) |  | 6SCB1 | ☐ 1 | Ⓡ2 | 1kΩ Resistor |  | 6SCR2 |
| ☐ 1 | | Base Grid (11.0" x 7.7") |  | 6SCBGBK | ☐ 1 | Ⓡ4 | 10kΩ Resistor |  | 6SCR4 |
| ☐ 2 | Ⓚ2 | Green LED |  | 6SCD2 | ☐ 1 | Ⓢ1 | Slide Switch |  | 6SCS1 |
| ☐ 1 | Ⓚ3 | Diode |  | 6SCD3 | ☐ 1 | Ⓢ2 | Speaker |  | 6SCSP2 |
| ☐ 1 | Ⓚ9 | Blue LED |  | 6SCD9 | ☐ 1 | Ⓢ2 | Alarm IC |  | 6SCU2 |
| ☐ 2 | Ⓚ10 | Red/Yellow LED |  | 6SCD10 | ☐ 1 | Ⓢ3 | Space War IC |  | 6SCU3 |
| ☐ 1 | | Jumper Wire, Black |  | 6SCJ1 | ☐ 1 | Ⓢ33 | SC Controller |  | 6SCU33 |

How to Use Boffin

Boffin uses components with snaps to build the different electrical and electronic circuits in the projects. Each component has a function: there are switch blocks, light blocks, battery blocks, different length wire blocks, etc. These components have different colors and numbers on them so that you can easily identify them. The components you will be using are marked with color symbols and level numbers, allowing you to easily snap them together to build a circuit.

For Example:

This is a component with a switch that has the (S1) mark on it. The colors and appearance may vary, so your component may look a little different, but you can easily recognize them.



This is a blue snap wire. They come in different wire lengths.

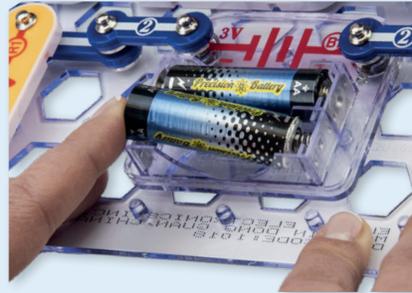
This one has the number (2), (3), (4), (5) or (6) on it depending on the length of the wire connection required.



There is also a 1-snap wire that is used as a spacer or for interconnection between different layers.



You need a power source to build each circuit. This is labeled (B1) and requires two (2) 1.5V "AA" batteries (not included).



When installing a battery, be sure the spring is compressed straight back, and not bent up, down, or to one side. Battery installation should be supervised by an adult.



The set includes a black base grid that is used for correct positioning of the individual parts of the circuit. You will see evenly spaced posts that the different blocks snap into. The base has rows labeled A-G and columns labeled 1-10.

Next to each component in the picture there is a black number.

This indicates which level the component is on, is located. First, place all the parts on level 1, then on level 2, level 3 - and so on.

Some circuits use the jumper wires to make unusual connections. Just clip them to the metal snaps or as indicated.



Usually when the motor (M1) is used, the fan will usually be placed on it. On top of the motor shaft is a black plastic piece (the motor top) with three little tabs. Lay the fan on the black piece so the slots in its bottom "fall into place" around the three tabs in the motor top. If not placed properly, the fan will fall off when the motor starts to spin.



Note: While building the projects, be careful not to accidentally make a direct connection across the battery holder (a "short circuit"), as this may damage and/or quickly drain the batteries.

DOs and DON'Ts of Building Circuits

After building the circuits given in this booklet, you may wish to experiment on your own. Use the projects in this booklet as a guide, as many important design concepts are introduced throughout them. Every circuit will include a power source (the batteries), a resistance (which might be a resistor, LED, motor, integrated circuit, etc.), and wiring paths between them and back. You must be careful not to create "short circuits" (very low-resistance paths across the batteries, see examples below) as this will damage components and/or quickly drain your batteries. Only connect the modules using configurations given in the projects, incorrectly doing so may damage them. **Conquest ent. is not responsible for parts damaged due to incorrect wiring.**

Here are some important guidelines:

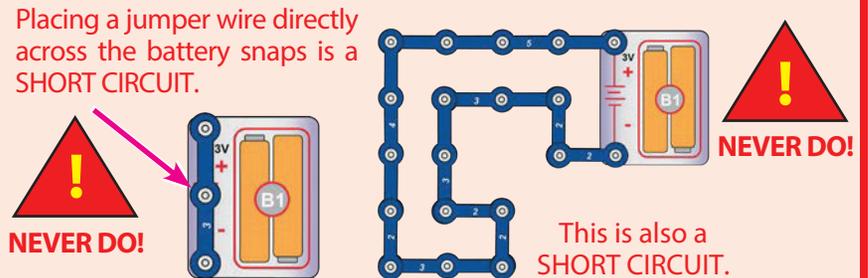
- ALWAYS** USE EYE PROTECTION WHEN EXPERIMENTING ON YOUR OWN.
- ALWAYS** include at least one component that will limit the current through a circuit, such as a motor, resistor, IC, or LED (which has an internal protection resistor).
- ALWAYS** use switches in conjunction with other components that will limit the current through them. Failure to do so will create a short circuit and/or damage those parts.
- ALWAYS** disconnect your batteries immediately and check your wiring if something appears to be getting hot.
- ALWAYS** check your wiring before turning on a circuit.
- NEVER** connect to an electrical outlet in your home in any way.
- NEVER** leave a circuit unattended when it is turned on.

For all of the projects given in this book, the parts may be arranged in different ways without changing the circuit. For example, the order of parts connected in series or in parallel does not matter — what matters is how combinations of these sub-circuits are arranged together.

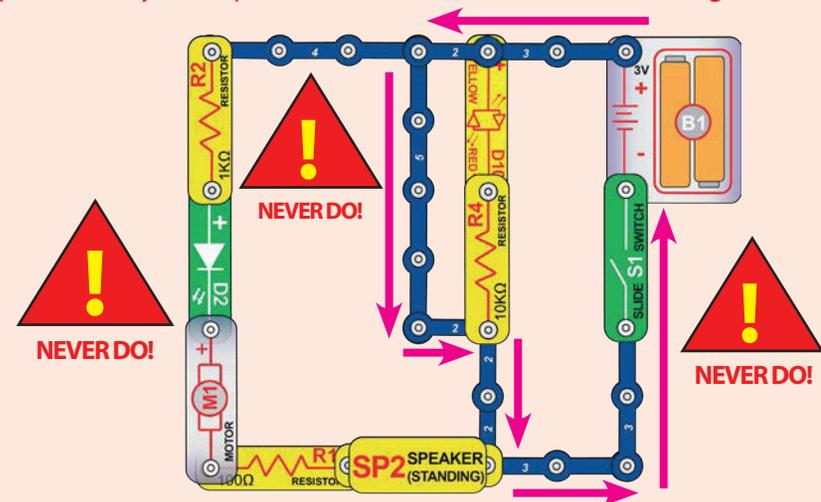


Warning to Boffin Users: Do not connect additional voltage sources from other sets, or you may damage your parts. Contact ConQuest Entertainment in case of questions at info@boffin.cz.

Examples of SHORT CIRCUITS - NEVER DO THESE!!!



When the slide switch (S1) is turned on, this large circuit has a SHORT CIRCUIT path (as shown by the arrows). The short circuit prevents any other portions of the circuit from ever working.



You are encouraged to tell us about new circuits and structures you create. If they are unique, we will post them with your name and state on our website at: www.boffin.cz/en

The instruction manual must be retained since it contains important information. This toy contains battery that are non-replaceable. **WARNING:** This toy produces flashes that may trigger epilepsy in sensitised individuals.



WARNING: SHOCK HAZARD - Never connect Boffin to the electrical outlets in your home in any way!

Advanced Troubleshooting

Company is not responsible for parts damaged due to incorrect wiring.

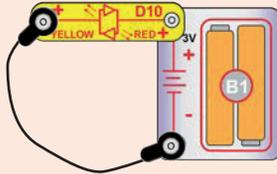
If you suspect you have damaged parts, you can follow this procedure to systematically determine which ones need replacing:

1. Battery holder (B1), motor (M1), and LEDs (D2, D9, & D10):

Place batteries in holder. Place each LED directly across the battery holder (LED "+" to battery "+"), it should light. The red/yellow LED (D10) should be red in one direction and yellow in the other direction. Touch the motor across the battery snaps (motor + to battery +), it should spin to the right at high speed. If none work, then replace your batteries and repeat, if still bad then the battery holder is damaged. If the motor spins but does not balance the fan in the projects, check that there is a black plastic piece with 3 prongs at the top of the motor shaft.

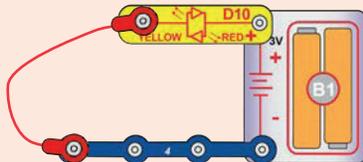
2. Jumper wires:

Use this mini-circuit to test each jumper wire, the LED should light.



3. Snap wires:

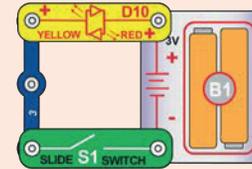
Use this mini-circuit to test each of the snap wires, one at a time. The LED should light.



4. Slide switch (S1), speaker (SP2), diode (D3), and resistors (R1, R2, & R4):

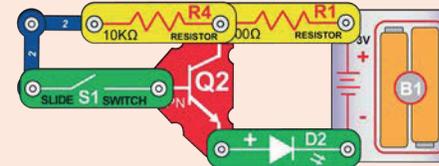
Use this mini circuit, the LED should be on when the switch is on and off when the switch is off, or the switch is broken. Replace the switch with the speaker, the LED should light or the speaker is broken. Replace the speaker with the diode ("+" on left), the LED should light or the diode is broken.

Replace the diode with the R1 resistor; the LED should light. Replace R1 with R2, LED should be dimmer. Replace R2 with R4, the LED should be much dimmer but still light.



5. NPN transistor (Q2):

Use this mini circuit, the red/yellow LED (D10) should only be on when the switch (S1) is on, or the transistor is broken.



6. Alarm IC (U2):

Build project 11, you should hear a siren. Then make the variants in parts B-D to get different sounds.

7. Space war IC (U3):

Build project 14, turning switch S1 on and off should change the sound. Then move the switch to points labeled A & B, turning S1 on and off, this should also change the sound.

8. SC Controller (U33):

Build project 1, the blue (Bluetooth) light on the SC Controller should be blinking when the switch (S1) is turned on. Connect the SC Controller to the App and use the Circuit screen of Control mode to light the LEDs connected to the 5 outputs (D1-D4 and A) on the SC Controller. Note: if this test works but turning on the motor (M1)/fan in other projects resets the SC Controller (making the blue Bluetooth light on it flashing instead of staying on) then replace your batteries.

You may order additional / replacement parts at: www.toy.cz

Guidelines For Classrooms or Home Schooling

This product is a tool for opening the exciting worlds of coding & electronics. Following the experiments concept, coding & electronics will be easy for students to understand by using Boffin to learn about circuits and the Boffin app to learn about coding. This kit emphasizes the practical applications of coding & electronics, without bogging down in mathematics. This course is as much about thinking processes & science as about coding & electronics.

Why should students learn about coding or electronics? Coding & electronics play important and increasing roles in their everyday lives, and so some basic knowledge of them is a must for everyone in today's society. Learning about them teaches how to do scientific investigation, logical thinking, and helps develop basic skills needed in today's world.

This product is intended for ages 8 and up, for adults and children who have attained sufficient maturity to read and follow directions and warnings.

It should take about 6 hours to do this entire book, or about 4 hours to do just the coding projects (projects 1, 10, 12, 13, 15-18). The focus of this set is to learn about coding and then to code on your own, so teachers should determine what is best for their students.

PREPARATION/ORGANIZATION

- Determine what the learning environment will be. Will the students be learning independently or in small groups? How much teacher instruction will there be for each section? Will the students be reading the lesson as homework and then have limited teacher instruction before performing the experiments? Decide if quizzes will be given and how they will be organized.
- Allocate time within the session as needed for:
 - Teacher instruction about the topics being covered during the session.
 - Getting the Boffin components into the workspace.
 - Teacher instruction about the specific projects to be performed during that session.
 - Building and testing the circuits.
 - Loading the Boffin and connecting to a controller circuit.
 - Performing experiments (and teacher verification if desired).
 - Dismantling the circuits and returning Boffin components to storage area.
 - Reassembling the class for review.
- Make sure the students know their objectives for the day, how much time they will need for cleanup, and where the materials are being stored.
- Students must understand that there are usually many ways of making the same circuit or program, and that the instructor may not know all the answers. They are doing scientific investigation, and many circuit projects & programs suggest variations to experiment with.
- Have students review the DO's and DON'Ts of Building Circuits on page 4 at the beginning of each session.

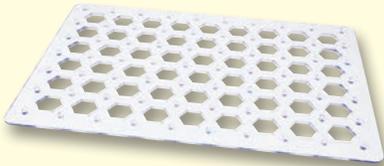
Project Listings

| Project | Description | Page |
|---------|---|-------|
| 1 | Coding 5 lights (Quick Start - Dive into coding) | 11-14 |
| II | Text code for commands | 15 |
| 2 | Electric light | 15 |
| 3 | Series & parallel circuits | 16 |
| 4 | Led comparison | 16 |
| 5 | Transistor inverter | 17 |
| 6 | Transistor currents | 17 |
| 7 | Fun circuit | 18 |
| 8 | Double sounds | 19 |
| 9 | Flying fan | 20 |
| 10 | Fan coding | 21-22 |
| 11 | Sirens | 23 |
| 12 | Sirens coding | 24-25 |
| 13 | 4 sirens coding | 26 |
| 14 | Space war | 27 |
| 15 | Space war coding | 28 |
| 16 | Space war coding upside down | 29-30 |
| 17 | Cover circuit | 31-32 |
| 18 | Countdown | 33 |

About Your Boffin Parts

BASE GRID

The **base grid** is a platform for mounting parts and wires. It functions like the printed circuit boards used in most electronic products, or like how the walls are used for mounting the electrical wiring in your home.



SNAP WIRES & JUMPER WIRES

The blue **snap wires** are wires used to connect components. They are used to transport electricity and do not affect circuit performance. They come in different lengths to allow orderly arrangement of connections on the base grid.



The colored **jumper wires** make flexible connections for times when using the snap wires would be difficult. They also are used to make connections off the base grid.



Wires transport electricity just like pipes are used to transport water. The colorful plastic coating protects them and prevents electricity from getting in or out.

(Part designs are subject to change without notice)

BATTERY HOLDER

Batteries produce an electrical voltage using a chemical reaction. This “voltage” can be thought of as electrical pressure, pushing electricity through a circuit just like a pump pushes water through pipes. This voltage is much lower and much safer than that used in your house wiring. Using more batteries increases the “pressure”, therefore, more electricity flows.



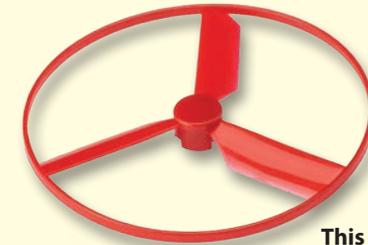
Battery Holder (B1)

MOTOR

The **motor (M1)** converts electricity into mechanical motion. An electric current in the motor will turn the shaft and the motor blades, and the fan blade if it is on the motor.

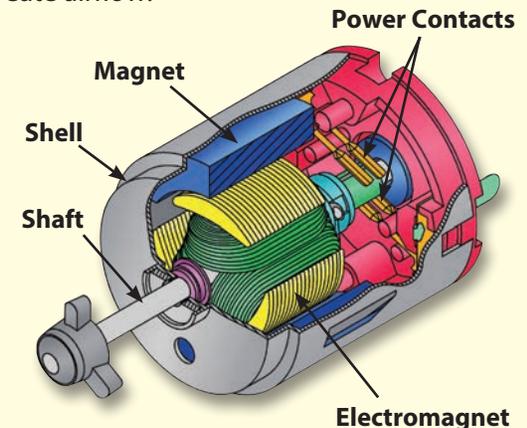


Motor (M1)



This set may have a red fan.

How does electricity turn the shaft in the motor? The answer is magnetism. Electricity is closely related to magnetism, and an electric current flowing in a wire has a magnetic field similar to that of a very tiny magnet. Inside the motor is a coil of wire with many loops wrapped around metal plates. This is called an electromagnet. If a large electric current flows through the loops, it will turn ordinary metal into a magnet. The motor shell also has a magnet on it. When electricity flows through the electromagnet, it repels from the magnet on the motor shell and the shaft spins. If the fan is on the motor shaft, then its blades will create airflow.



About Your Boffin Parts

DIODES & LEDs

The **diode (D3)** is like a one-way valve that only lets current flow in the direction of the arrow in its symbol. The diode has a turn-on threshold of about 0.7V that voltage must exceed before any current will flow.

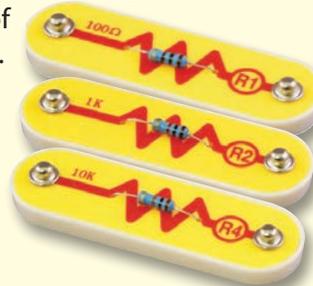
The green, blue, and red/yellow LEDs (D2, D9, & D10) are light emitting diodes, and may be thought of as special one-way light bulbs. The color emitted depends on the material used in their construction. Their turn-on threshold is higher than for a normal diode, about 1.5V for red, about 2.0V for green, and about 3.0V for blue; brightness then increases. The red/yellow LED contains red and yellow LEDs connected in opposite directions in the same package. A high current will burn out an LED, so the current must be limited by other components in the circuit, however your Snap Circuits® LEDs have internal resistors to protect against incorrect wiring). Like normal diodes, LEDs block electricity in the “reverse” direction.



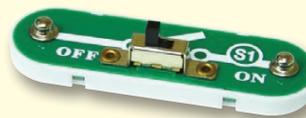
(Part designs are subject to change without notice)

RESISTORS & SWITCH

Resistors “resist” the flow of electricity and are used to control or limit the current in a circuit. This set includes **100Ω (R1), 1kΩ (R2), and 10kΩ (R4) resistors** (“k” symbolizes 1,000, so R4 is really 10,000Ω). Materials like metal have very low resistance (<1Ω), while materials like paper, plastic, and air have near-infinite resistance. Increasing circuit resistance reduces the flow of electricity.



The **slide switch (S1)** connects (“ON”) or disconnects (“OFF”) the wires in a circuit. When ON it has no effect on circuit performance. Switches turn on electricity just like a faucet turns on water from a pipe.



SPEAKER

The **speaker (SP2)** converts electricity into sound by making mechanical vibrations. These vibrations create variations in air pressure, which travel across the room. You “hear” sound when your ears feel these air pressure variations.

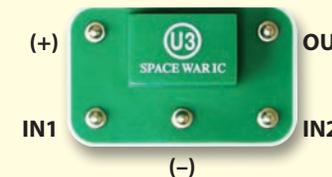


ELECTRONIC MODULES

The **alarm and space war ICs (U2 and U3)** contain specialized sound-generation ICs and other supporting components (resistors, capacitors, and transistors) that are always needed with them. This was done to simplify the connections you need to make to use them.



Alarm IC:
IN1, IN2, IN3 – control inputs
(-) - power return to batteries
OUT - output connection
Connect control inputs to (+) power to make five alarm sounds, see project 11 for configurations.



Space War IC:
(+) - power from batteries
(-) - power return to batteries
OUT - output connection
IN1, IN2 - control inputs
Connect each control input to (-) power to sequence through 8 sounds.

The **SC Controller (U33)** lets you control Boffin parts using Bluetooth. Its functions and use are described on page 34.

TRANSISTORS

The NPN (Q2) transistor is a component that uses a small electric current to control a large current, and is used in switching, amplifier, and buffering applications. Transistors are easy to miniaturize, and are the main building blocks of integrated circuits including the microprocessor and memory circuits in computers.



Introduction to Electricity

What is electricity? Nobody really knows. We only know how to produce it, understand its properties, and how to control it. Electricity is the movement of sub-atomic charged particles (called **electrons**) through a material due to electrical pressure across the material, such as from a battery.

Power sources, such as batteries, push electricity through a circuit, like a pump pushes water through pipes. Wires carry electricity, like pipes carry water. Devices like LEDs, motors, and speakers use the energy in electricity to do things. Switches and transistors control the flow of electricity like valves and faucets control water. Resistors limit the flow of electricity.

The electrical pressure exerted by a battery or other power source is called **voltage** and is measured in **volts (V)**. Notice the “+” and “-” signs on the battery; these indicate which direction the battery will “pump” the electricity.

The **electric current** is a measure of how fast electricity is flowing in a wire, just as the water current describes how fast water is flowing in a pipe. It is expressed in **amperes (A)** or **milliamperes (mA)**, 1/1000 of an ampere).

The “**power**” of electricity is a measure of how fast energy is moving through a wire. It is a combination of the voltage and current (Power = Voltage x Current). It is expressed in **watts (W)**.

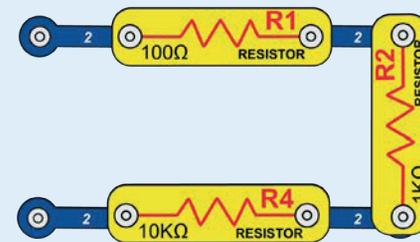
The **resistance** of a component or circuit represents how much it resists the electrical pressure (voltage) and limits the flow of electric current. The relationship is Voltage = Current x Resistance. When the resistance increases, less current flows. Resistance is measured in **ohms (Ω)**, or **kilo ohms (k Ω , 1000 ohms)**.

Nearly all of the electricity used in our world is produced at enormous generators driven by steam or water pressure. Wires are used to efficiently transport this energy to homes and businesses where it is used. Motors convert the electricity back into mechanical form to drive machinery and appliances.

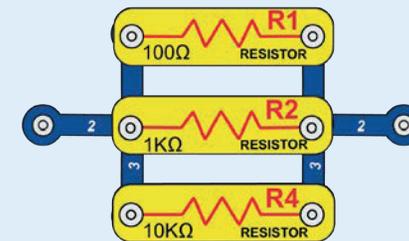
The most important aspect of electricity in our society is that it allows energy to be easily transported over distances.

Note that “distances” includes not just large distances but also tiny distances. Try to imagine a plumbing structure of the same complexity as the circuitry inside a portable radio - it would have to be large because we can’t make water pipes so small. Electricity allows complex designs to be made very small.

There are two ways of arranging parts in a circuit, in series or in parallel. Here are examples:



Series Circuit



Parallel Circuit

Placing components in series increases the resistance; highest value dominates. Placing components in parallel decreases the resistance; lowest value dominates.

The parts within these series and parallel sub-circuits may be arranged in different ways without changing what the circuit does. Large circuits are made of combinations of smaller series and parallel circuits.

WELCOME TO CODING!

All computers, micro-controllers, apps, and websites are controlled using lines of code, which tell the device what to do, in what order, and when. You probably do not realize how many devices in your home or vehicle have microprocessors or simpler micro-controllers that use code to tell them what to do. Code controls thermostats for heating and air conditioning, digital clocks, vehicle fuel injection systems, oven timers, timers for outdoor lighting systems, stoplights, sprinkler control systems, computers, music players, and many others. Code also controls what you see on websites and apps.

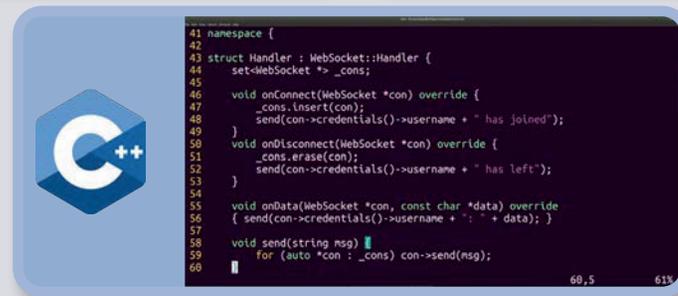
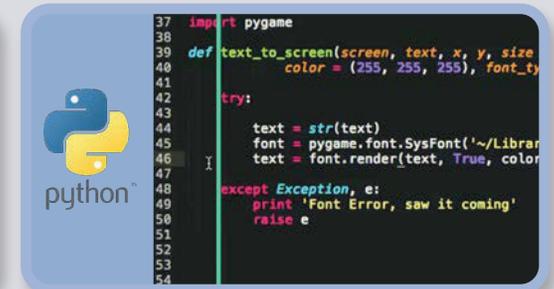
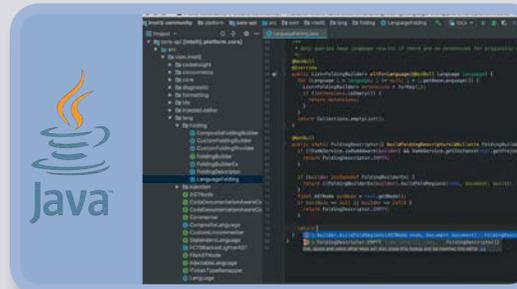
Understanding coding helps you understand logical thinking and problem solving. When you code you create a series of steps to make your device do what you want. It is important that your coding instructions be clear and orderly because a coding controller (or any computer) does what you tell it to do - which may not be what you want it to do.

A computer does not understand any of the programming languages we use, or even graphical programming like the Boffin app. A computer is made up of millions of transistors that can only be turned on or off. These transistors can be grouped together in large numbers to form digital memories and do calculations. The computer or app code we write gets translated into a much longer but very simple form that is used to turn transistors on and off. Many different programming languages have been developed to work with the many different designs for computer hardware (microprocessors, micro-controllers, memories, video controllers), to focus on different applications, or to be easier to use. The Boffin app that you will be using is simple and easy to use, making it a great introduction to the world of coding.

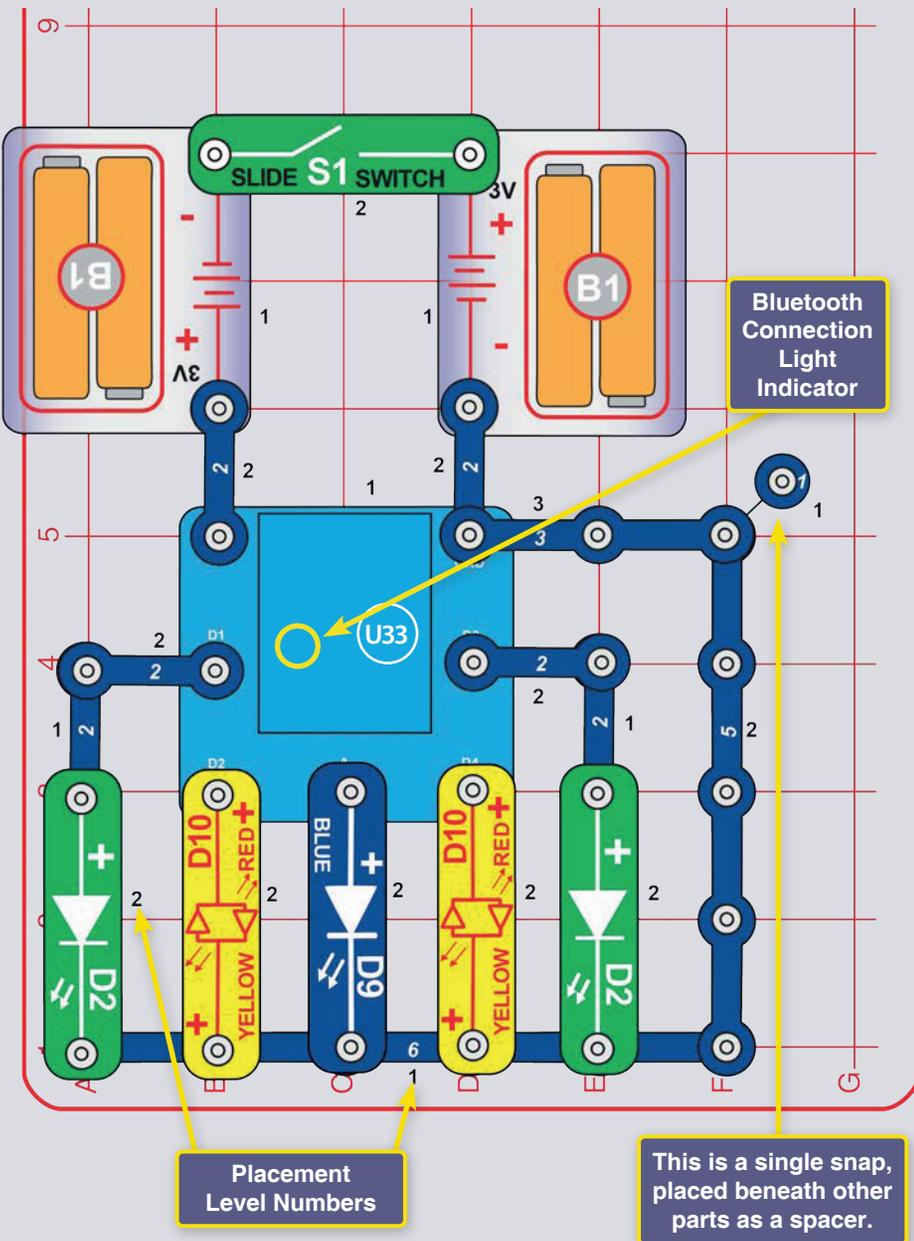
FORM OF CODE YOU WILL BE USING



OTHER FORMS OF CODE



PROJECT 1



CODING 5 LIGHTS

(QUICK START - DIVE INTO CODING)

This is a summarized version of the SBoffin app instructions for those already familiar with Boffin and apps and want to just start coding. To first learn more about Boffin start with projects 2-9, 11 and 14. For more detailed app instructions, see page 34.

Boffin uses electronic components that snap onto a plastic grid to build different circuits. These components have different colors and numbers on them so that you can easily identify them.

Build the circuit shown on the left by placing all the parts with a black 1 next to them on the board first. Then, assemble parts marked with a 2. Then, assemble the part marked with a 3. Install two (2) "AA" batteries (not included) into the battery holders (B1) if you have not done so already. **When installing a battery, be sure the spring is compressed straight back, and not bent up, down, or to one side. Battery installation should be supervised by an adult.**

1. Build the circuit shown here, and turn on the slide switch (S1). A blue light on the controller (U33) should be flashing, indicating that the module is waiting for a Bluetooth connection to a device.
2. Go to the app store on your device and find the Boffin app; install and open it.



Google
Play Store



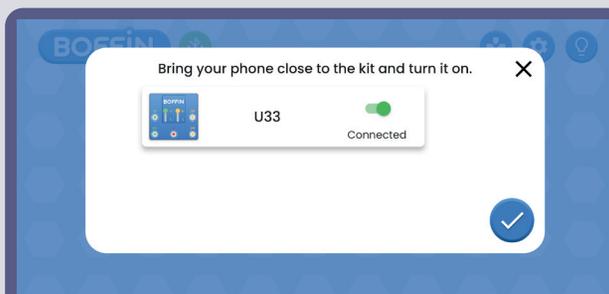
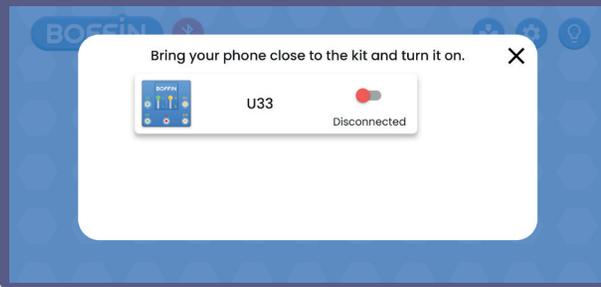
App
Store



3. Activate location and bluetooth on your phone and open the Boffin app.



Click on the red Bluetooth icon and your phone will pair with the Boffin kit (via part U33).



Confirm in the bottom right corner and the pairing is done.



You are now ready to Control or Code.

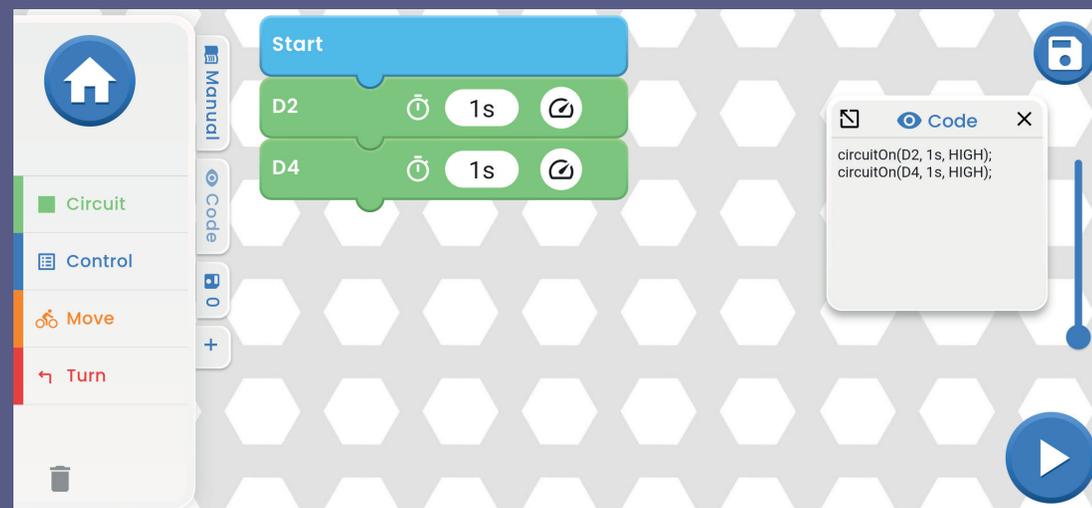
4. Go to the main menu (CONTROL - CODE - MANUALS). Click on CONTROL and the control panel (CP) will appear.



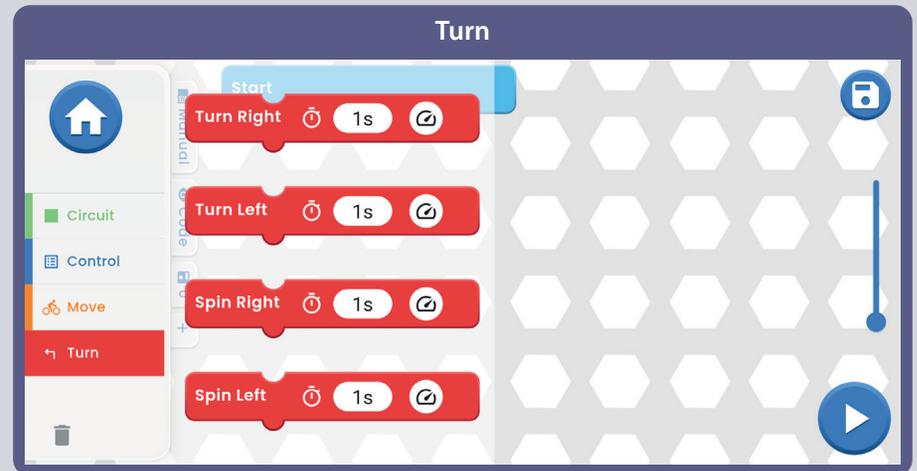
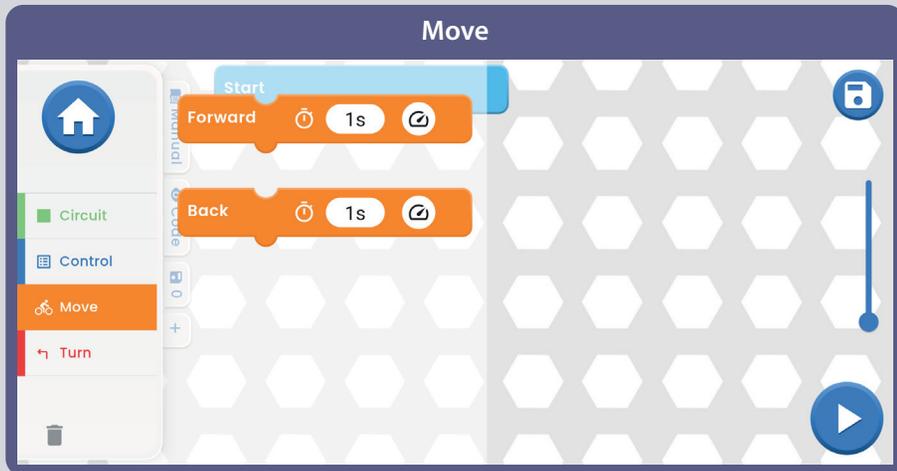
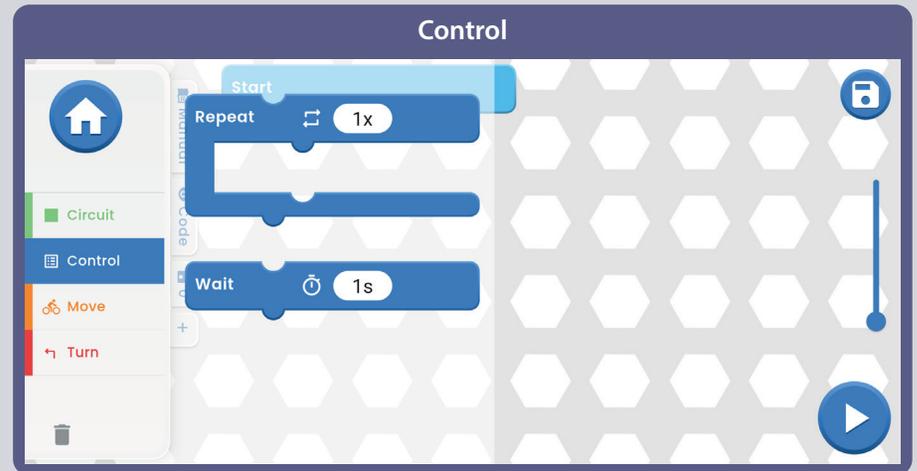
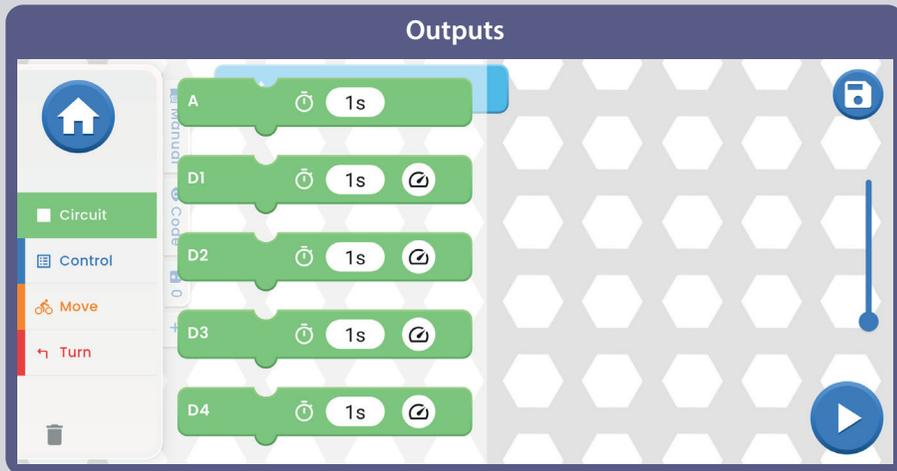
CP has 5 outputs (D1, D2, D3, D4 and A) which are controlled by the app. Outputs D1-D2 and D3-D4 are paired so that each controls a motor in both directions and they can be used to set one of the two levels output voltages, called H (high) and L (low). Output A has a low power output that can control the horn (W1), but cannot control the car's wheel motors. Use the app to control them.

7. Via the main menu of the application menu, open CODE section.

The individual commands are dragged from the list on the left into the programming zone in the middle. You can choose from Outputs/Control/Move/Turn



Boffin app screen



Now that you know the basics of the Boffin app, program the U33 controller to do different things with the lights in this circuit. Here are some programming examples: drag-drop the commands into the program area, edit the time and voltage levels, and then run the program once or continuously.

Experiment with changing parameters for commands, such as the time duration.

CHALLENGES

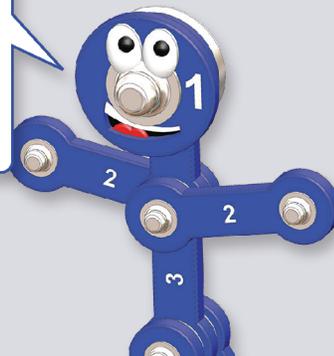
- Turn on only the green LEDs, then only the red LEDs.
- Make an LED turn on for several seconds, then off for a much shorter time.
- Make an LED flash every 20 seconds.
- Flip one of the red/yellow LEDs (D10) around to its yellow side, then program a stoplight pattern using red, yellow, and green LEDs.
- Try to get the lights blinking in a pattern like a beat to a song.

Turn on D1, low brightness, then high brightness.

Turn on the 5 LEDs one at a time.

Turn on LEDs one at a time until all are on, then turn them off one at a time.

Limitations of the U33 controller: Controller has only circuit outputs (no inputs), so it cannot make measurements or decisions based on anything happening in your circuit. Also, the A output on the controller can only supply low currents, so it cannot be used to control the car motors directly.



Text code for commands

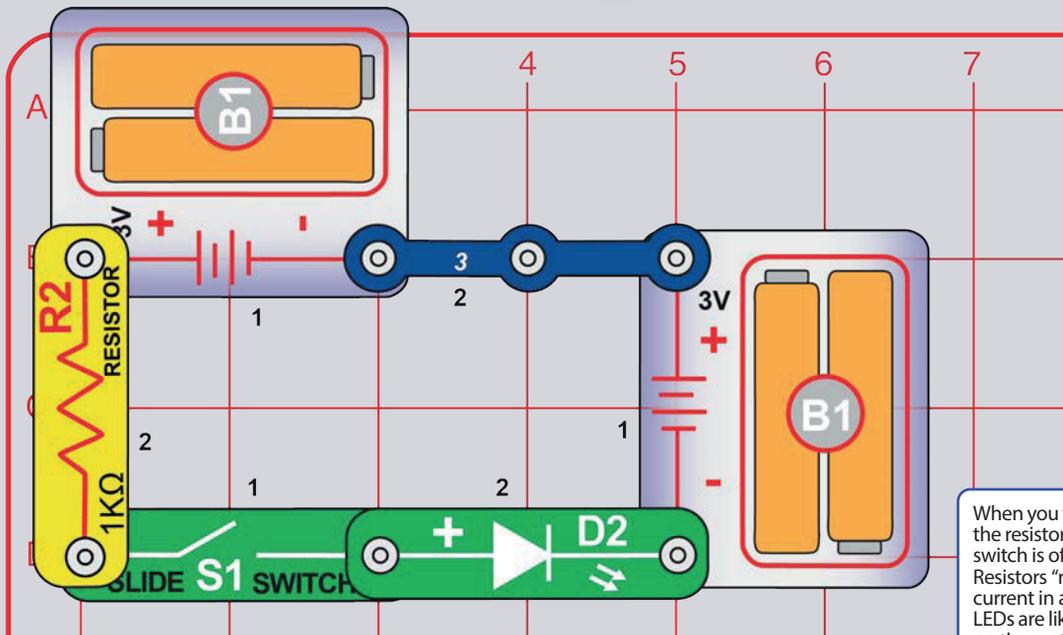
After completing the code in the main field and clicking on the code tab, the text code for the commands is displayed, see image.

```

circuitOn(D1, ∞, HIGH);
wait(1s);
circuitOn(D2, 1s, HIGH);
circuitOn(D3, 1s, HIGH);
circuitOn(D4, 1s, HIGH);
circuitOn(D1, 0, HIGH);
    
```

NOTE: Projects 2-9, 11 and 13 are an introduction to your parts and basic circuits without coding. To jump to the other Coding projects skip to projects 10, 12, 13, and 15-18.

PROJECT 2



ELECTRIC LIGHT

Turn on the slide switch (S1), and the green LED (D2) lights.

Part B: Replace the 1kΩ resistor (R2) with the larger 10kΩ resistor (R4) or the smaller 100Ω resistor (R1) and see how the LED brightness changes.

Part C: Reverse the position of the LED (so it is backwards) and see how the LED works in reverse.

Part D: Replace the green LED (D2) with the blue LED (D9) and try the above circuits again.

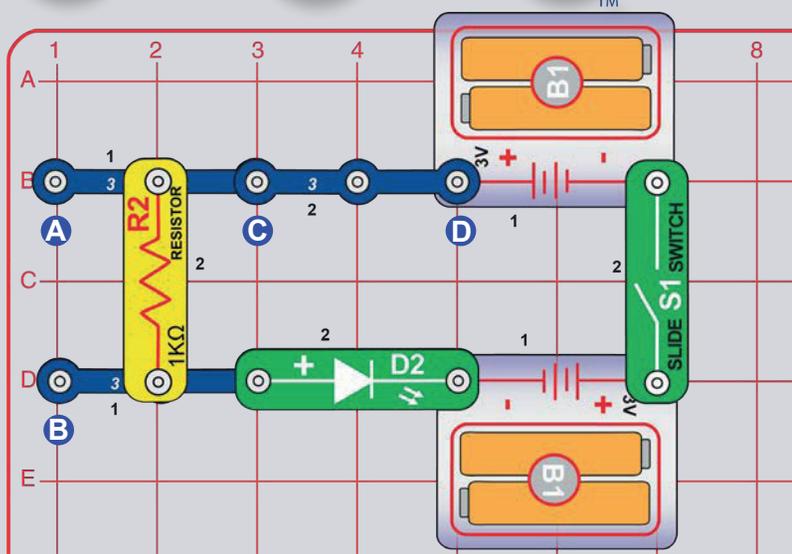
Part E: Replace the LED with the red/yellow LED (D10); try it in both orientations.

Part F: Reduce the battery voltage by replacing one of the battery holders (B1) with a 3-snap wire and see how the LED brightness changes for any of the above LED-resistor configurations.

When you turn on the slide switch, electricity flows from the batteries through the resistor, then the switch, then the LED, and then back to the batteries. If the switch is off, the flow of electricity is blocked, and the LED won't light. Resistors "resist" the flow of electricity and are used to control or limit the current in a circuit. LEDs are like one-way light bulbs that can produce different colors depending on the material used in them.



PROJECT 3



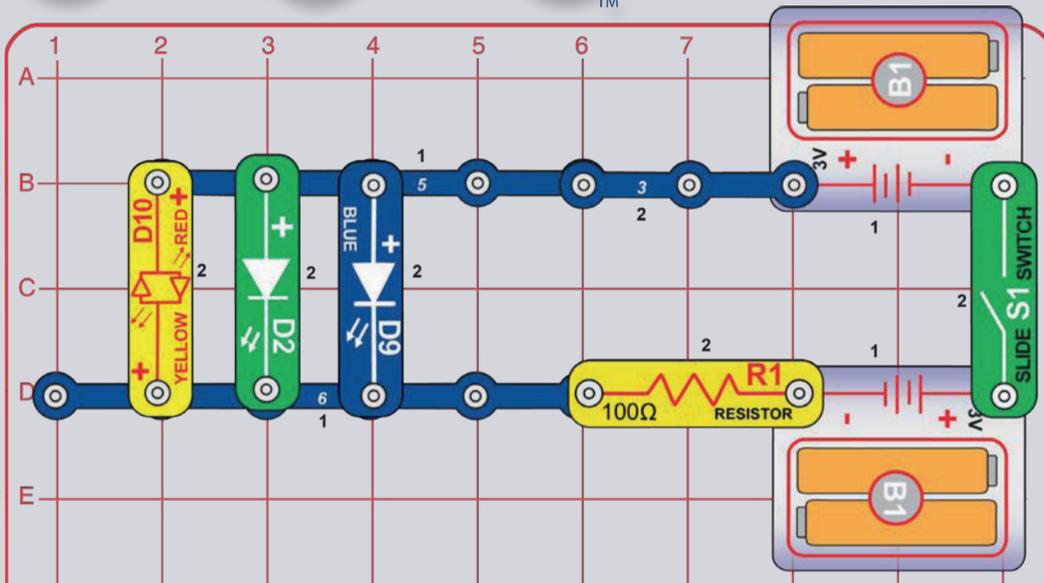
SERIES & PARALLEL CIRCUITS

Build the circuit as shown and turn on the slide switch (S1); the green LED (D2) lights. Now place the larger 10kΩ resistor (R4) or the smaller 100Ω resistor (R1) between the points labeled A & B, so it is next to (and in parallel with) the 1kΩ resistor (R2), and see how the LED brightness changes.

Part B: Use the original circuit but replace the 3-snap wire at points C & D with 10kΩ resistor (R4) or the 100Ω resistor (R1), placing that resistor in series with the 1kΩ resistor (R2). Notice how the resistors combine to affect the LED brightness.

Part C: Use the original circuit but replace the 3-snap wire at points C & D with another LED (D2, D9, or D10, "+" on right, D10 in either orientation). Compare the LED brightness two LEDs are in series. You can also replace the 1kΩ resistor (R2) with the larger 10kΩ resistor (R4) or the smaller 100Ω resistor (R1) and see how the LED brightness changes.

PROJECT 4



LED COMPARISON

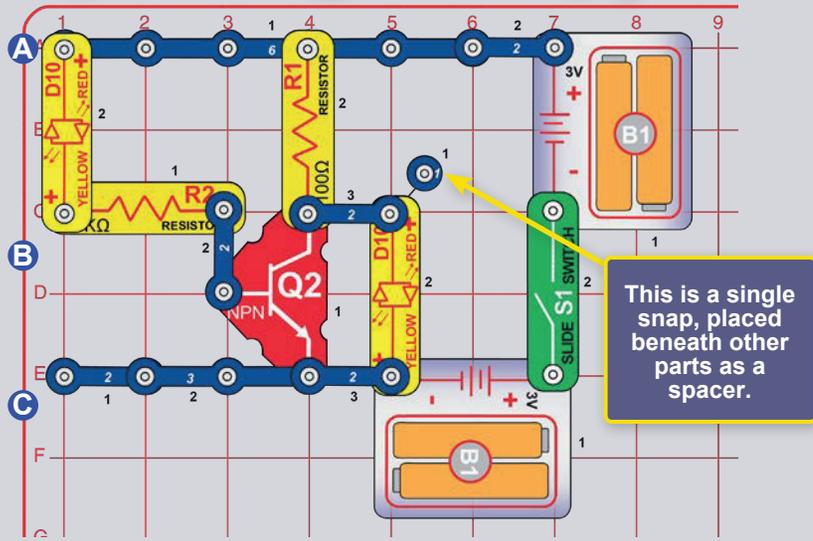
Build the circuit as shown and turn on the slide switch (S1); the three LEDs (D10, D2, & D9) light. Now replace the 100Ω resistor (R1) with the larger 1kΩ resistor (R2) and then the much larger 10kΩ resistor (R4) and see how the brightness changes on each LED.

Try the red/yellow LED (D10) in both red and yellow orientations. Your set includes a second green LED and red/yellow LED, so you can experiment with different LEDs and have up to five at once (add two more to the right of the blue LED).

Electricity flows through an LED if the voltage exceeds a turn-on threshold (about 1.5V for red, about 2.0V for green, and about 3.0V for blue). The resistor limits the voltage/current through all the LEDs, but the blue LED is affected the most because of its higher turn-on level.



PROJECT 5



TRANSISTOR INVERTER

Build the circuit as shown, and turn on the slide switch (S1). The left LED is on and the right one is off.

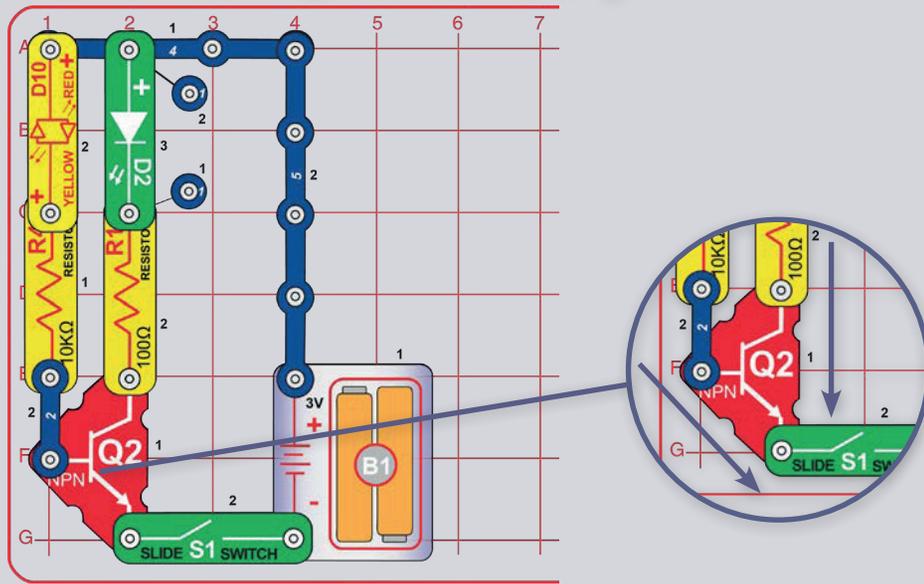
Now remove the left LED (which is across points labeled A & B) and place it across the points labeled B & C (positioned in either direction), or leave it disconnected (which is functionally the same as connecting across points B & C). Now the left LED is off and the right one is on.

Notice that the two LEDs are opposites - when one is on, the other is off.

Transistors like your NPN transistor (Q2) use a small current to control a larger current and are used in switching and amplifier circuits. In this circuit a small current flows into Q2 through R2, controlling a larger current into Q2 through R1. This control allows the right LED to be opposite of the left LED or inverted. The transistor will later be used to invert a voltage in coding project 15.



PROJECT 6

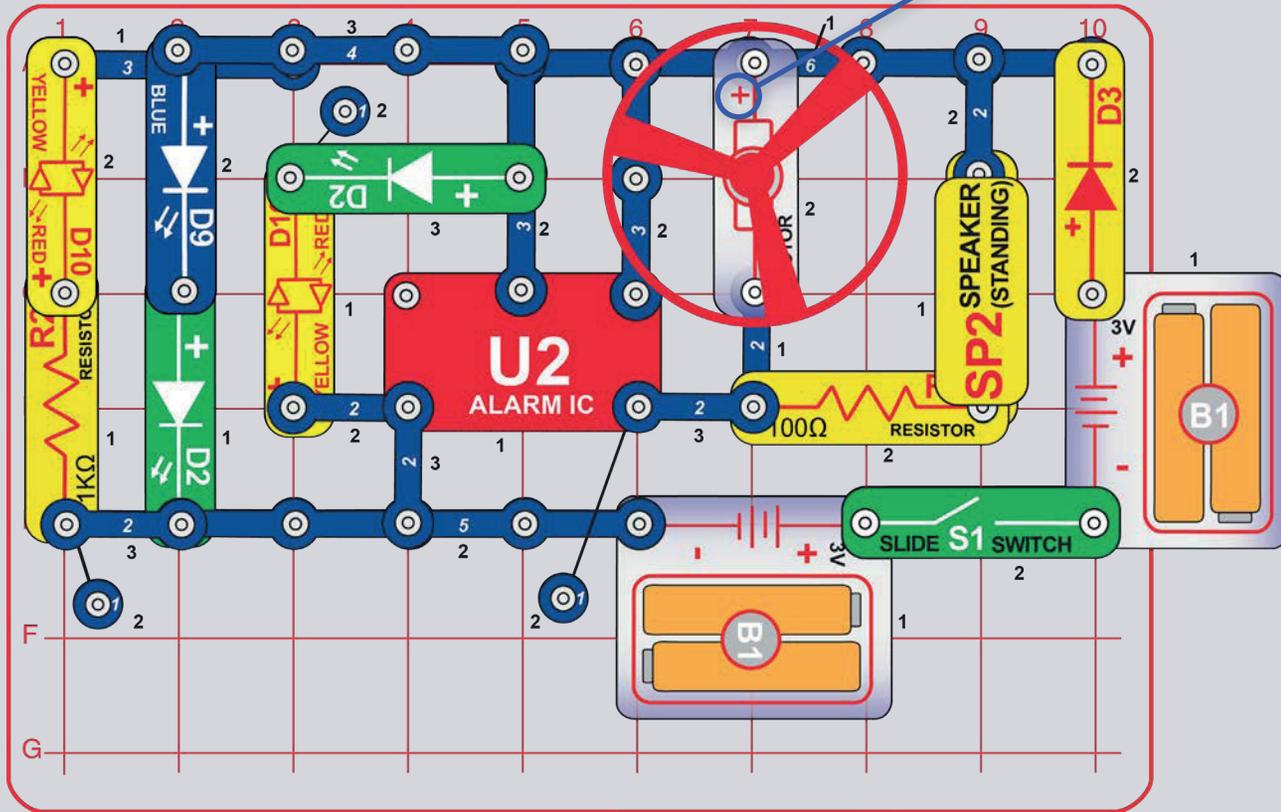


TRANSISTOR CURRENTS

Build the circuit as shown, and turn on the slide switch (S1). The red/yellow LED (D10) is dim and the green LED (D2) is bright. Try removing each LED and see if the other still lights.

A small current flowing into the left connection of the NPN transistor controls a larger current flowing into the top connection. Both currents exit out of the bottom connection.

PROJECT 7



FUN CIRCUIT

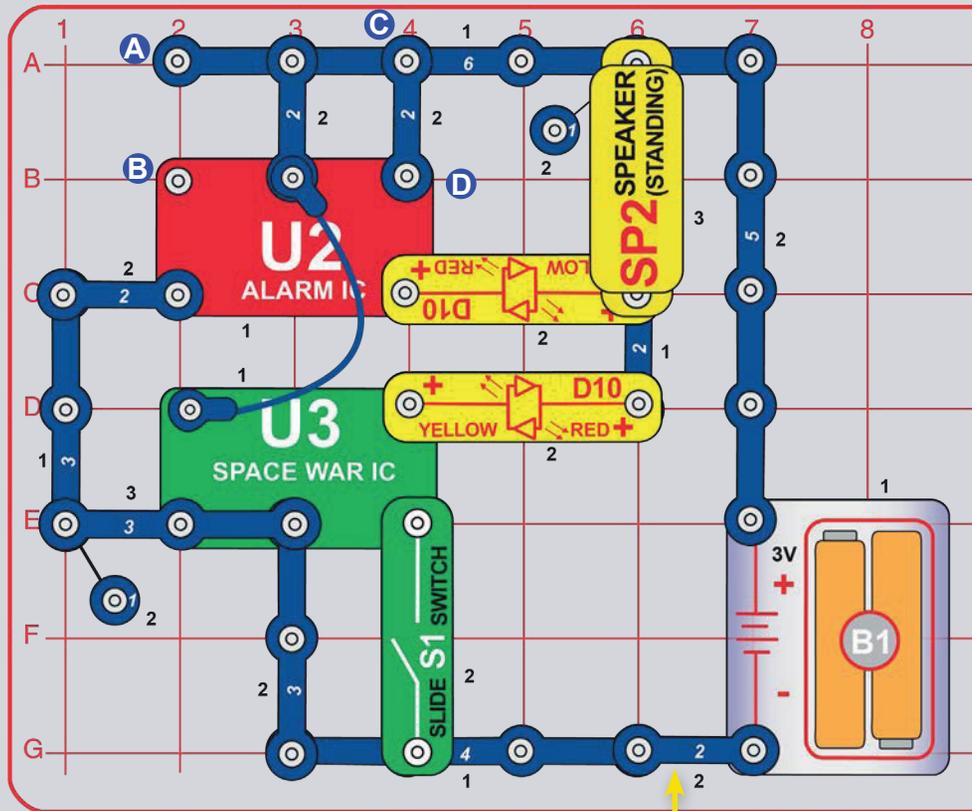
Build the circuit as shown and turn on the slide switch (S1). Lights shine, the motor (M1) spins, and a machine gun sound is heard.
 If you swap the locations of the 100Ω resistor (R1) and 1kΩ resistor (R2) then the red/yellow LED (D10) will be brighter and the sound will not be as loud.

WARNING: Moving parts. Do not touch the fan or motor during operation. Do not lean over the motor. Fan may not rise until switch is released. Eye protection is recommended for this circuit.

Why do the LEDs flicker? When the fan starts to spin, the battery voltage drops a little due to the added load of driving the motor and speaker. If you remove the motor from the circuit then the LED flicker will be much less and there would be no LED flicker at all, if you removed the motor and the speaker.



PROJECT 8

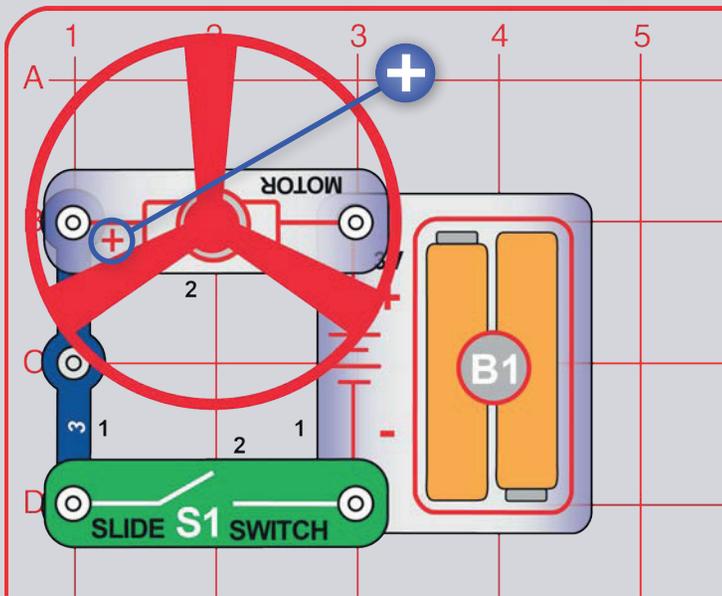


DOUBLE SOUNDS

Build the circuit as shown, but connect the 2-snap wire at bottom last. The sound starts immediately. Turn the slide switch (S1) on and off several times to add space war sounds.

Change the sound by removing the 2-snap wire at points C & D or moving it to points A & B.

PROJECT 9



FLYING FAN

Build the circuit as shown. Turn on the slide switch (S1) until the motor reaches full speed, then turn it off. The fan blade should rise and float through the air like a flying saucer. Be careful not to look directly down on fan blade when it is spinning.

If the fan doesn't fly off, then turn the switch on and off several times rapidly when it is at full speed. You may need to have new alkaline batteries for the fan to fly.

Part B: "Super Flying Saucer": Replace the 3-snap wire with another battery holder (B1). The fan will spin faster and fly higher, making it easy to lose your fan. Elenco® Electronics Inc. is not responsible for lost or broken fans! You may purchase replacement fans at www.toy.cz.

Part C: "Fan": Use either of the preceding circuits but reverse the position of the motor (M1), so its "+" is on the right. Now it acts like a fan, but does not fly.

NOTE: See project 10 to launch the fan using coding, and see how much more control coding gives you.

⚠ WARNING: Moving parts. Do not touch the fan or motor during operation. Do not lean over the motor. Fan may not rise until switch is released. Eye protection is recommended for this circuit.

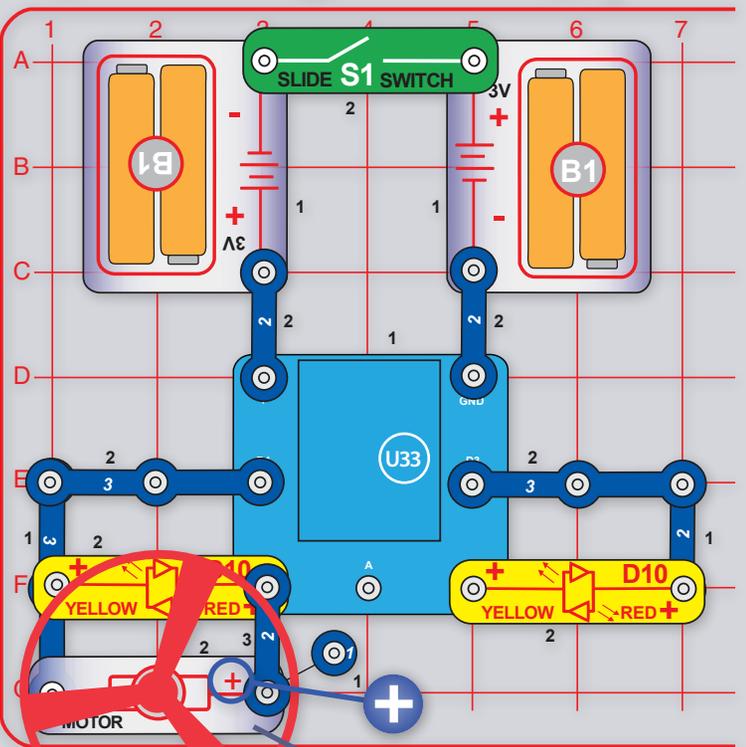
The air is being blown down through the blade and the motor rotation locks the fan on the shaft. When the motor is turned off, the blade unlocks from the shaft and is free to act as a propeller and fly through the air. If speed of rotation is too slow, the fan will remain on the motor shaft because it does not have enough lift to propel it.

In part C ("Fan"), the fan is blowing air upward; place your hand a short distance above the motor and you should be able to feel it.

In this project electrical power was changed into mechanical power. Motors like this one are used in battery powered equipment requiring rotary motion, such as a cordless drill, electric toothbrush, and toys. An electric motor is much easier to control than gas or diesel engines.



PROJECT 10



FAN CODING

Build the circuit shown here and turn on the switch (S1). Open the Boffin app, connect to the U33 Controller, and use the Control Panel (under CODE) to spin the fan and light the LEDs. See project 1 and pages 34-43 to review how to use the app.

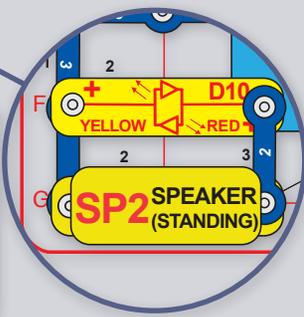
The fan can fly off if it is controlled properly. Be careful not to look directly down on fan blade when it is spinning. If the fan doesn't fly off, then turn the switch on and off several times rapidly when it is at full speed. You may need to have new alkaline batteries for the fan to fly.

Next, put the app in Code mode and create some code to light the LEDs and spin the fan. Experiment with changing parameters for commands, such as the time duration.

Code Screen: Turn on LED & fan, speed up the fan, then reverse the fan and make it fly.



The D1-D2 and D3-D4 outputs on the U33 controller are connected together so an electric current flows between them if one is on and the other is off. If both D1 and D2 (or D3 and D4) are both on or both off, then no current flows between them.



CHALLENGES

- Make the right LED flash several times, turn on fan and launch it.
- Make fan spin in short bursts in opposite directions, but not fly off.
- Get the fan to fly to different heights.

Part B, Beep & Flash: Replace motor (M1) with the speaker (SP2), then create the program shown here.

Beep & flash. Run this program continuously.

The screenshot shows a programming environment with a sidebar on the left containing icons for Home, Manual, Circuit, Control, Move, and Turn. The main workspace contains a sequence of blocks: a blue 'Start' block, followed by two green blocks labeled 'D1' and 'D2', each with a timer set to '1s'. A code window on the right displays the following code: `circuitOn(D1, 1s, LOW);` and `circuitOn(D2, 1s, LOW);`. A play button is visible in the bottom right corner.

Control Panel screen

The screenshot shows a control panel interface titled 'BOFFIN'. It features four indicator lights labeled D1, D2, D3, and D4. D1 and D2 are green, D3 and D4 are yellow. There are also two toggle switches labeled 'H' and 'L' in the center, and a red emergency stop button at the bottom.

Turn on the LEDs, alternately between yellow and red.

The screenshot shows a programming environment with a sidebar on the left containing icons for Home, Manual, Circuit, Control, Move, and Turn. The main workspace contains a sequence of blocks: a blue 'Start' block, followed by green blocks for 'D1' (2s), 'D4' (2s), 'D2' (2s), and 'D3' (2s), and blue 'Wait' blocks (2s) in between. A code window on the right displays the following code: `circuitOn(D1, 2s, HIGH);`, `circuitOn(D4, 2s, HIGH);`, `wait(2s);`, `circuitOn(D2, 2s, HIGH);`, `circuitOn(D3, 2s, HIGH);`, and `wait(2s);`. A play button is visible in the bottom right corner.

⚠ WARNING: Moving parts. Do not touch the fan or motor during operation. Do not lean over the motor. Fan may not rise until switch is released. Eye protection is recommended for this circuit!

Boffin app screen: 2 sirens

Start

D4 5s

Wait 2s

D4 ∞

A 5s

```

circuitOn(D4, 5s, HIGH);
wait(2s);
circuitOn(D4, ∞, HIGH);
circuitOn(A, 5s);

```

Control panel screen

BOFFIN

D1 H L D3

D2 A D4

3 Sirens

Start

D4 ∞

Wait 2s

A 2s

D3 2s

D4 0

Wait 2s

```

circuitOn(D4, ∞, HIGH);
wait(2s);
circuitOn(A, 2s);
circuitOn(D3, 2s, HIGH);
circuitOn(D4, 0, HIGH);
wait(2s);

```

Play a siren and then launch fan.

Start

D4 ∞

A 5s

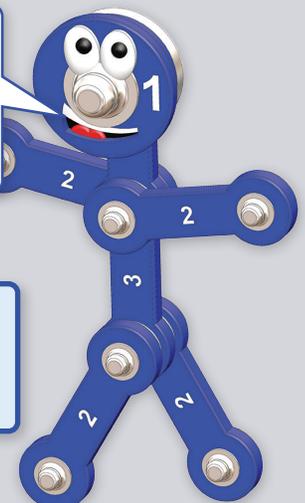
D1 3s

```

circuitOn(D4, ∞, HIGH);
circuitOn(A, 5s);
circuitOn(D1, 3s, HIGH);

```

The diode (D3) blocks electricity from flowing from the A or D3 outputs (when they are turned on) on the U33 controller through the alarm IC, and back into the D4 output (when it is turned off) on the U33 controller. The alarm IC would not operate properly if that happened.

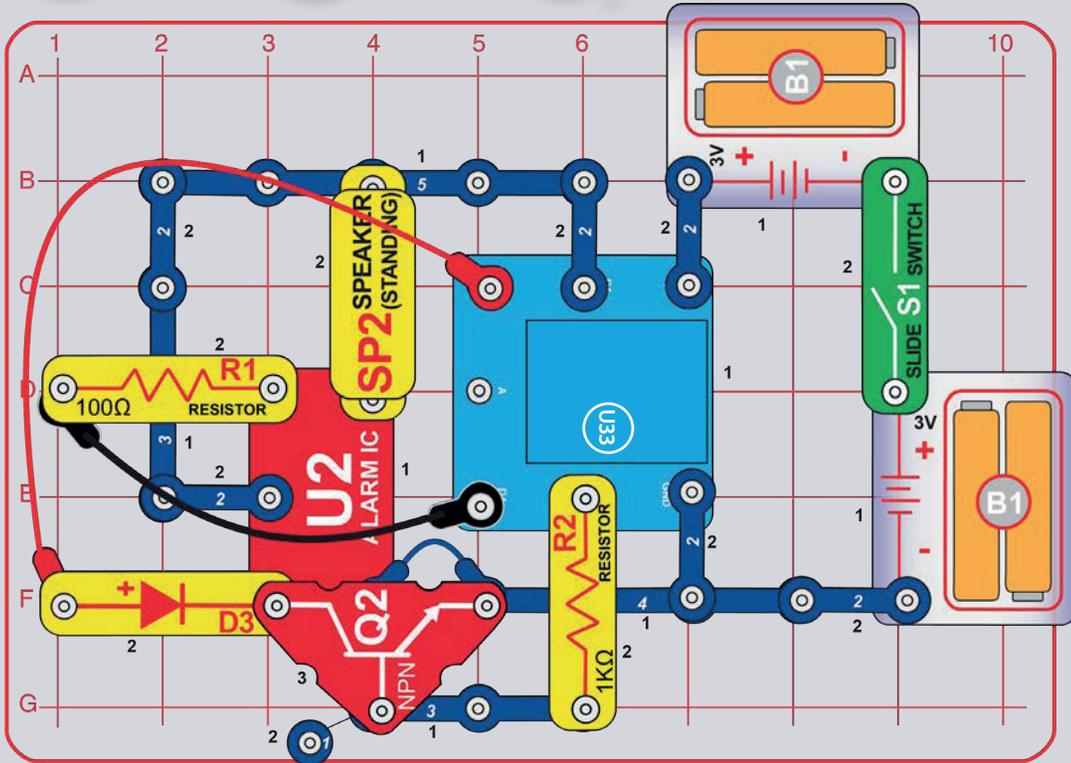


CODING CHALLENGE

- Play a siren for different durations using the same program.
- Turn motor forwards and then backwards.

NOTE: If your batteries are weak then turning on the motor (M1)/fan may reset the U33 controller (making the blue Bluetooth light start flashing instead of staying on); if this happens then replace your batteries.

PROJECT 13



4 SIRENS CODING

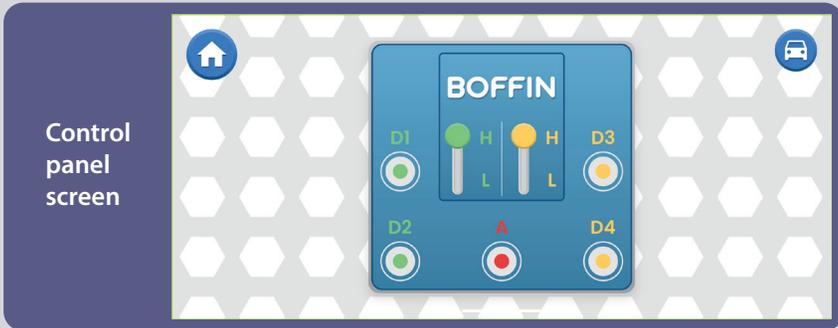
Build the circuit shown here, note that the blue jumper wire is connected beneath the NPN transistor (Q2). Turn on the switch (S1). Open the Boffin app, connect to the U33 Controller, and use the Control Panel (under CODE) to activate sirens. See project 1 and pages 34-43 to review how to use the app.

Next, put the app in Code mode and create some code to sound different sirens. Experiment with changing parameters for commands, such as the time duration.

The alarm IC (U2) can produce four siren sounds, as shown in project 11. Those sirens can be produced by controlling the U33 Controller outputs as follows:

- Siren 1. D1 on, others off.
- Siren 2. D1 and D2 on, others off.
- Siren 3. D1 and D3 on, others off.
- Siren 4. D1 and D4 on, others off.

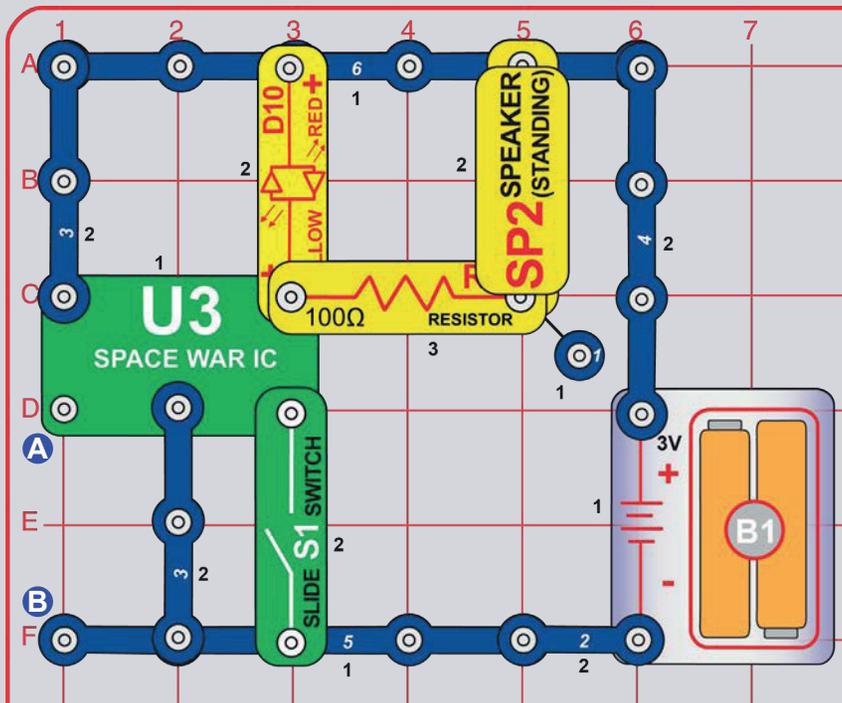
What do you think the NPN transistor (Q2) is used for in this circuit?



CODING CHALLENGE

- Play different sirens for different durations in the same program.





SPACE WAR

Build the circuit as shown. Activate it and change the sound by turning the slide switch (S1) on and off repeatedly. The red/yellow LED (D10) also lights.

Next add a 3-snap wire across the points marked A & B; connect and disconnect it several times, and do it in combination with the slide switch. You will hear an exciting range of sounds, as if a space war is raging!

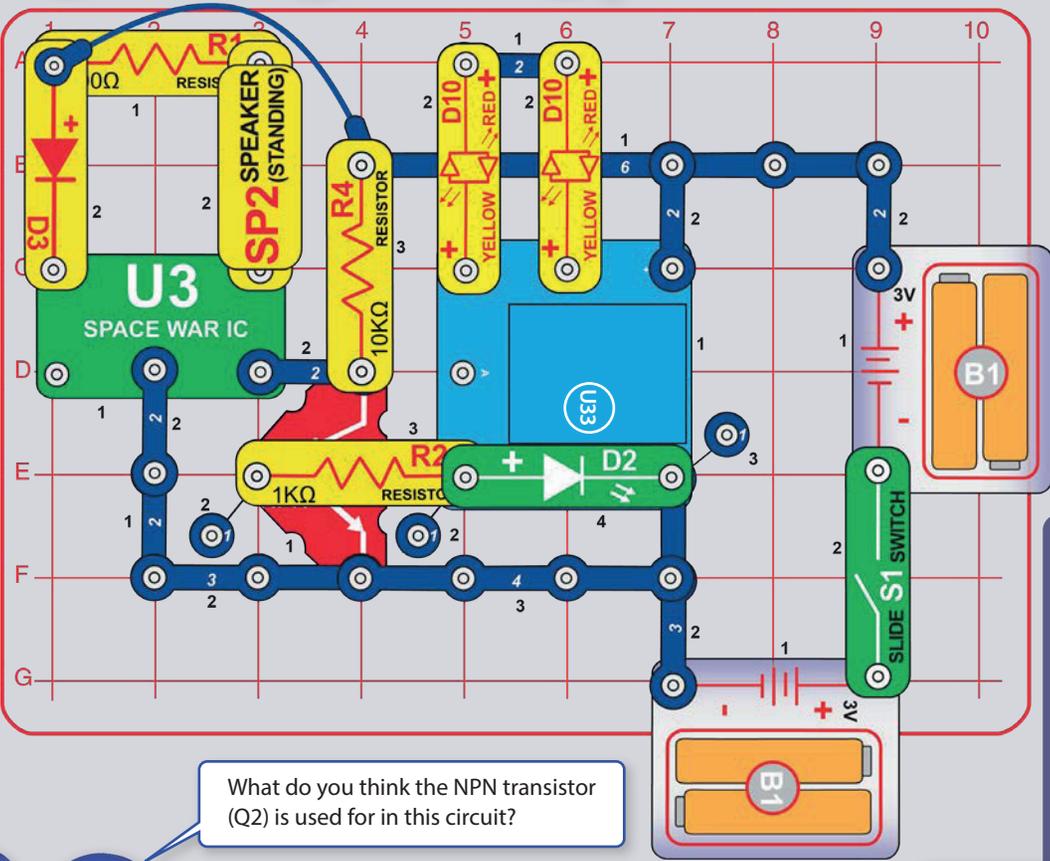
You can make the sound louder by replacing the 100Ω resistor (R1) with the blue jumper wire, or make it softer by replacing R1 with the 1kΩ resistor (R2).

NOTE: See projects 15-16 to control the space war IC using coding, and see how much more control coding gives you.

Like the other integrated circuits, the space war IC is a superminiaturized electronic circuit that can play a variety of cool sounds stored in it by using just a few extra components. In movie studios, technicians are paid to insert these sounds at the precise instant a gun is fired. Try making your sound occur at the same time an object hits the floor. It is not as easy as it sounds.

The upper-right snap of the space war IC is like an electrical gate, opening and closing quickly to let small bursts of electric current flow in. The bursts of electric current also flow through the speaker (which produces sound). The space war IC produces the different sounds by adjusting the pattern of two separate current bursts through the speaker.

PROJECT 15



SPACE WAR CODING

Build the circuit shown here and turn on switch (S1). Open the Boffin app, connect to the U33 controller, and use Code mode to activate and change the sound. See project 1 and page 34-43 to review how to use the app.

Next, put the app in Code mode and create code to sound different sirens. Experiment with changing parameters for commands, such as the time duration.

You can make the sound louder by replacing the 100Ω resistor (R1) with a 3-snap wire or make the sound softer by replacing R1 with an LED (“+” on left).

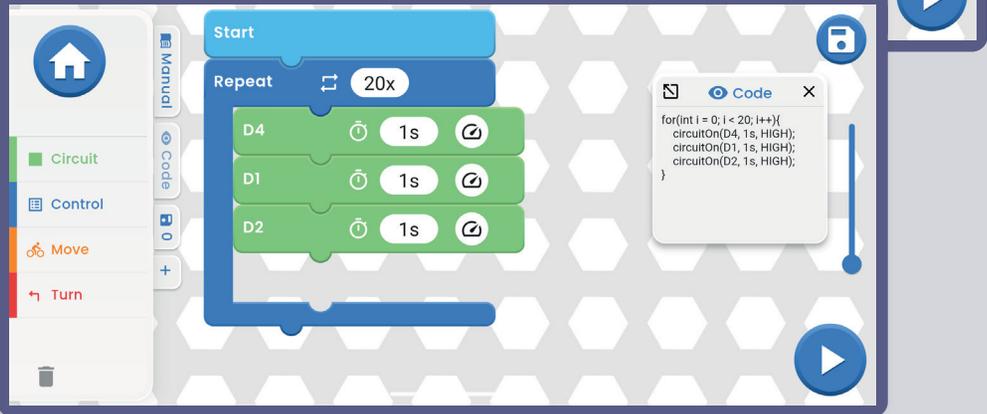
What do you think the NPN transistor (Q2) is used for in this circuit?



Boffin app screen: Change Sound [Run this program continuously.]

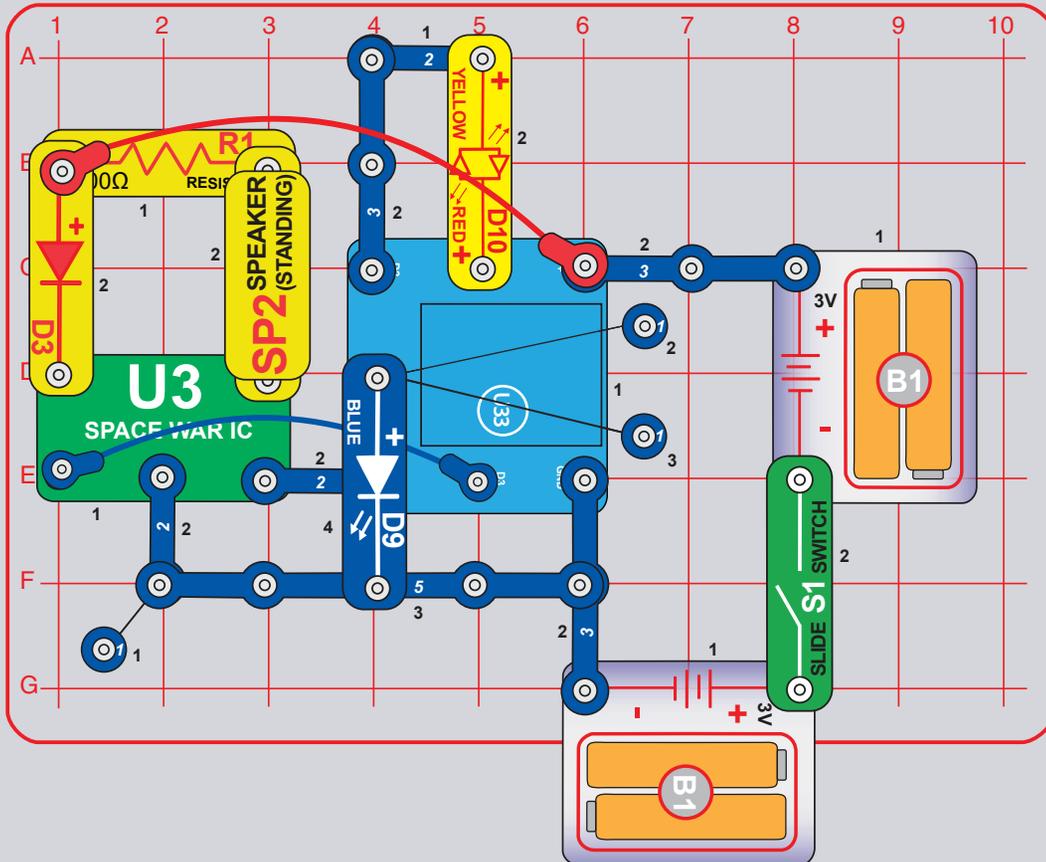


Change the sound 20 times and flash LEDs. Run this program once (not continuously).



CODING CHALLENGE

- Play a space war sound for a second, then wait 5 seconds and play another.



SPACE WAR CODING UPSIDE DOWN

This project uses the U33 controller to control the space war IC (U3) like the preceding project but does not include the NPN transistor (Q2). It works almost the same way, but here there are two connections between the U33 controller and the space war IC, and the U33 controller control is opposite - when you turn the circuit on, the sound is on unless you use the U33 controller to turn the sound off.

Build the circuit shown here and turn on the switch (S1). Open the Boffin app, connect to the U33 controller, and use Code mode to activate and change the sound. Note that here the sound will begin immediately, so you must turn on D3 and D4 to stop the sound. See project 1 and pages 34-43 to review how to use the app.

Next, put the app in Code mode and create code to sound different sirens. Experiment with changing parameters for commands, such as the time duration. Note that here the sound will begin immediately, so you must turn on D3 and D4 to stop the sound. You may want to disconnect the speaker (SP2) while you are writing code.

You can make the sound louder by replacing the 100Ω resistor (R1) with a jumper wire, or make the sound softer by replacing R1 with the 1kΩ resistor (R2) or an LED ("+" on left).

Boffin app Screen: Change the sound. [Run this program continuously.]

The screenshot shows the Boffin app interface. On the left is a sidebar with icons for Home, Circuit, Control, Move, and Turn. The main workspace contains a program starting with a 'Start' block, followed by a 'D3' block with a duration of 0, and a 'D4' block with a duration of 1s. A 'Code' window is open, displaying the code: `circuitOn(D3, 0, HIGH);` and `circuitOn(D4, 1s, HIGH);`. A play button is visible in the bottom right corner.

Control panel screen

The screenshot shows the control panel screen. It features a central 'BOFFIN' label above four sliders labeled D1, D2, D3, and D4. Each slider has 'H' (High) and 'L' (Low) positions. Below the sliders is a red 'A' button. The background has a hexagonal pattern.

The screenshot shows the Boffin app interface with a more complex program. It starts with a 'Start' block, followed by 'D3' and 'D4' blocks both set to infinity. Then there is a 'Wait' block for 2s, followed by a 'D3' block set to 0. A 'Repeat' block is set to 20x and contains two 'D4' blocks: one set to 0 and one set to 1s. The 'Code' window shows the following code: `circuitOn(D3, ∞, HIGH);`, `circuitOn(D4, ∞, HIGH);`, `wait(2s);`, `circuitOn(D3, 0, HIGH);`, and a `for` loop that repeatedly calls `circuitOn(D4, 0, HIGH);` and `circuitOn(D4, 1s, HIGH);`. A play button is visible in the bottom right corner.

Stop the sound, wait, then change the sound 20 times. [Run program once or continuously.]

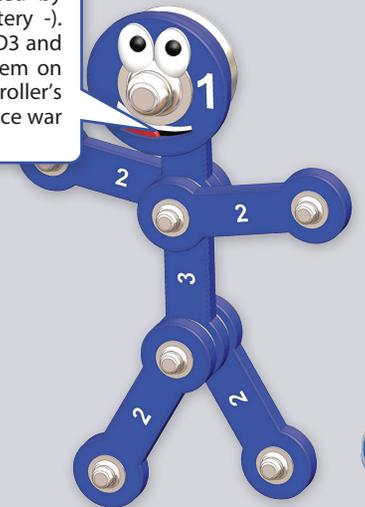
Change the sound, with a pause between sounds. [Run program once or continuously.]

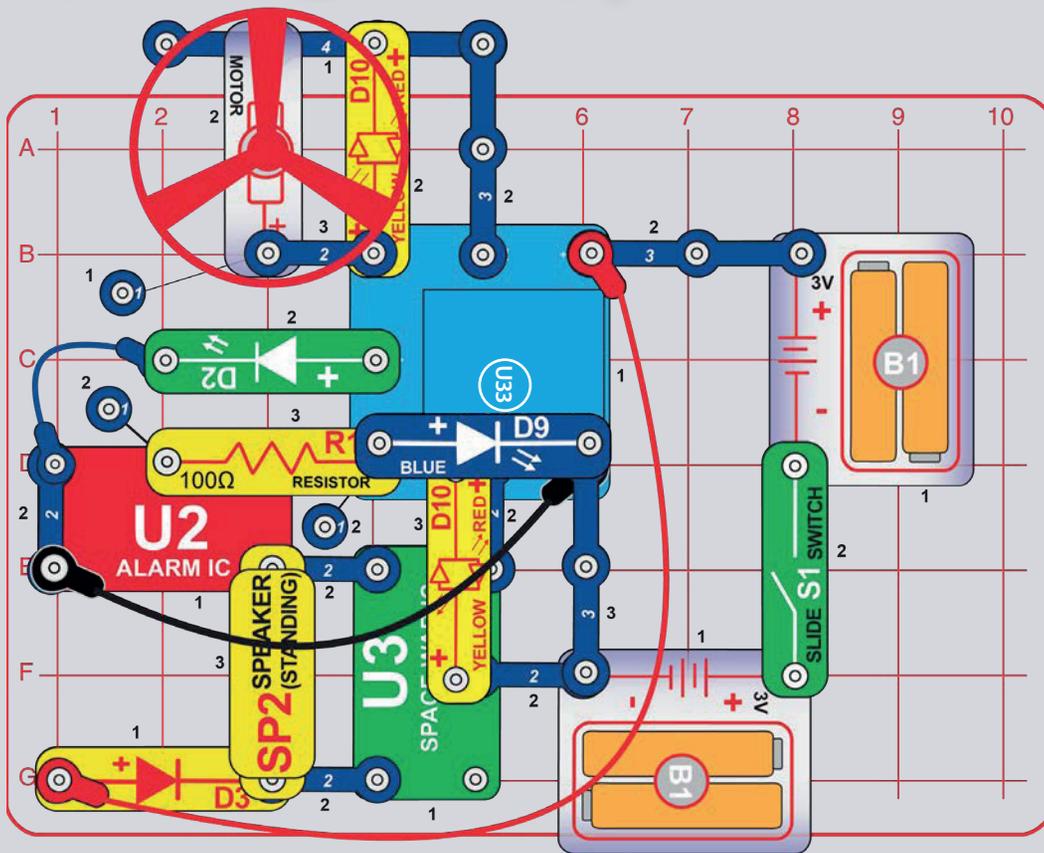
The screenshot shows the Boffin app interface with a program that plays a sound for an infinite duration and then repeats a 2-second sound 10 times. The program starts with a 'Start' block, followed by a 'D3' block set to infinity. A 'Repeat' block is set to 10x and contains a 'D4' block set to 2s. The 'Code' window shows the following code: `circuitOn(D3, ∞, HIGH);` and a `for` loop that repeatedly calls `circuitOn(D4, 2s, HIGH);`. A play button is visible in the bottom right corner.

CODING CHALLENGES

- Play sounds for only a short time each. How short can you make them?
- Play each sound for 5 seconds or longer.
- Count how many different space war sounds there are.

The space war IC (U3) sound is activated by connecting its control snaps to 0V (battery -). When the U33 controller is turned on, its D3 and D4 outputs are off (0V) until you turn them on using the app. So when the U33 controller's outputs are off, they are activating the space war IC's sound.





⚠ WARNING: Moving parts. Do not touch the fan or motor during operation. Do not lean over the motor. Fan may not rise until switch is released. Eye protection is recommended for this circuit.

COVER CIRCUIT

This project combines most of your set's features into one circuit. Build the circuit shown (it is also pictured on the cover of your box and this booklet) and turn on the switch (S1). Open the Boffin app, connect to the U33 controller, and use Code mode to activate sirens. See project 1 and pages 34-43 to review how to use the app.

Next, put the app in Code mode and create some code to sound different sirens. Experiment with changing parameters for commands, such as the time duration.

Note: In this circuit the space war sounds begin immediately, so you must turn on U33 controller output D3 to stop the sound.

Note: If your batteries are weak then turning on the motor (M1)/fan may reset the U33 controller (making the blue Bluetooth light on it flashing instead of staying on); if this happens then replace your batteries.

Features controlled by the U33 Controller outputs:

- D1 controls the fan (and can make it fly) and makes the top LED (D10) red.
- D2 controls the fan (but does not make it fly) and makes the top LED yellow.
- The A output controls the green LED (D2).
- D3 controls the space war IC (U3) sounds and makes the bottom LED red. Note that the space war sounds begin on and can only be turned off by turning on D3.
- D4 controls the alarm IC (U2) sound and the blue LED (D9).

If you want to stop the sound while you create code, remove the speaker (SP2) or replace it with your extra green LED (D2, "+" on bottom).

Have lots of fun.

Manual

Code

0

+

Circuit

Control

Move

Turn

```

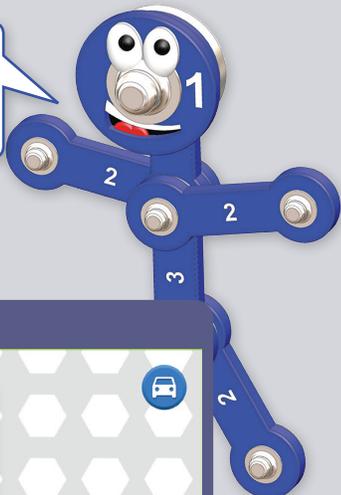
Start
D3 ∞
D2 2s
Repeat 10x
  A 1s
D4 ∞
D3 0
Repeat 10x
  D3 1s
D1 3s
Repeat 10x
  D3 1s
D1 3s
D3 ∞
        
```

Code

```

circuitOn(D3, ∞, HIGH);
circuitOn(D2, 2s, HIGH);
for(int i = 0; i < 10; i++){
  circuitOn(A, 1s);
}
circuitOn(D4, ∞, HIGH);
circuitOn(D3, 0, HIGH);
for(int i = 0; i < 10; i++){
  circuitOn(D3, 1s, HIGH);
}
circuitOn(D1, 3s, HIGH);
for(int i = 0; i < 10; i++){
  circuitOn(D3, 1s, HIGH);
}
circuitOn(D1, 3s, HIGH);
circuitOn(D3, ∞, HIGH);
        
```

This complex circuit is shown on the cover of your box and manual, use that picture as a guide in building it.



Control panel screen

Home
Menu

BOFFIN

Boffin app screen: Have Fun

Manual

Code

0

+

Circuit

Control

Move

Turn

```

Start
D3 1s
D2 3s
A 2s
D4 5s
        
```

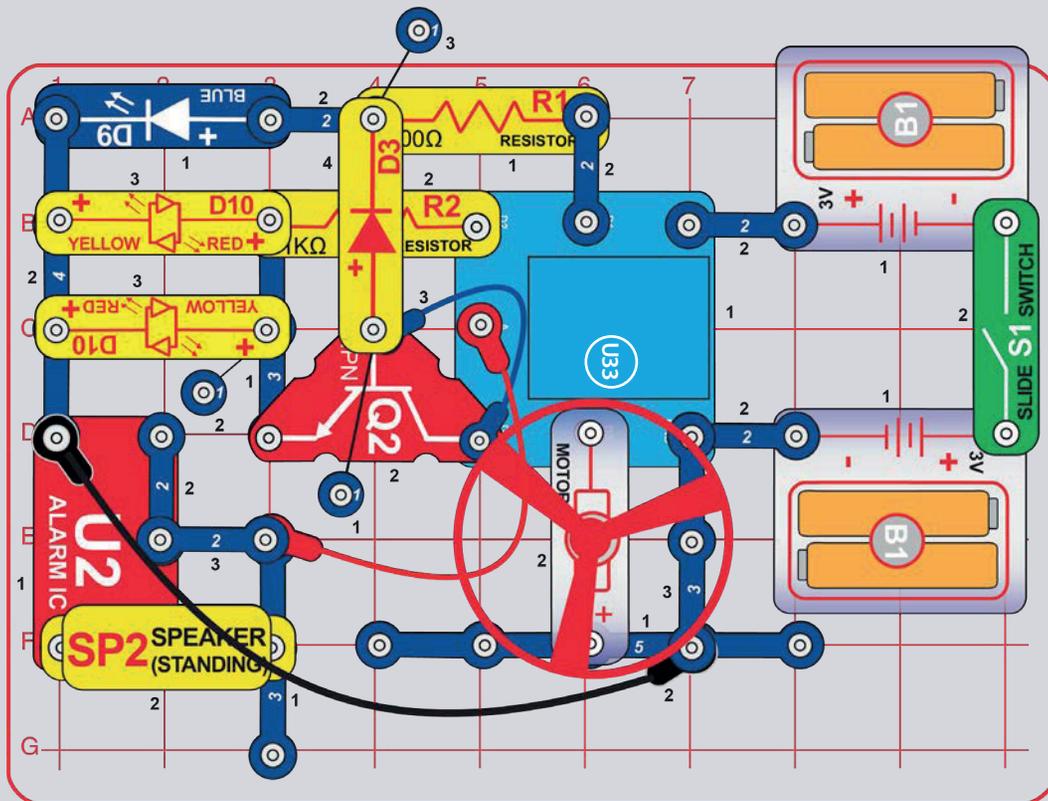
Code

```

circuitOn(D3, 1s, HIGH);
circuitOn(D2, 3s, LOW);
circuitOn(A, 2s);
circuitOn(D4, 5s, HIGH);
        
```

CODING CHALLENGE

- Flash lights and play sounds, then launch the fan.

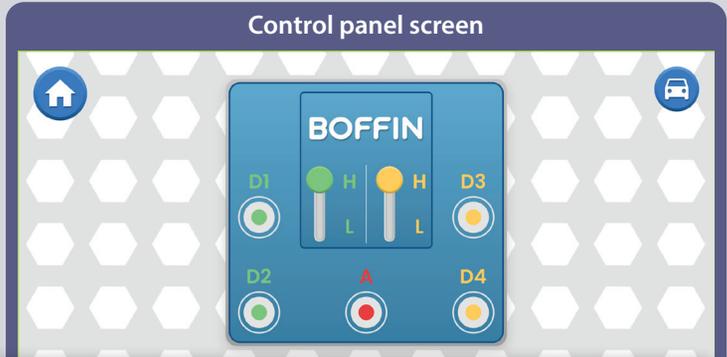


⚠ WARNING: Moving parts. Do not touch the fan or motor during operation. Do not lean over the motor. Fan may not rise until switch is released. Eye protection is recommended for this circuit.

COUNTDOWN

Build the circuit shown here, note that the blue jumper wire is connected beneath the NPN transistor (Q2). Turn on the switch (S1). Open the Boffin app, connect to the U33 Controller, and use CODE mode to activate lights, a siren, or the motor (M1) and fan. See project 1 and pages 34-43 to review how to use the app.

Next, put the app in Code mode and create some code to activate lights, sound, or motion, or use the “Countdown” program shown below. Experiment with changing parameters for commands, such as the time duration.



Boffin app screen: Countdown: light 1 LED, then 2 LEDs, then 3 LEDs, then siren, then launch fan.



CODING CHALLENGE

- Spin the fan, play a siren, and light 3 LEDs at the same time.

HOW TO DOWNLOAD AND USE THE BOFFIN APP



MEET THE CONTROLLER

The controller module (U33) has 5 outputs (D1, D2, D3, D4, and A) that are controlled through Bluetooth using an Boffin app on your device. D1-D2 and D3-D4 are paired so they can each control a motor in both directions and can be set to either of two output voltage levels, called H (Higher - 5V) and L (Lower - 3V). Output A has low power and cannot control most motors.

The controller can be controlled from the Boffin app on your Bluetooth device in two ways:

1. Control panel (remote control in real-time).
2. Boffin app (simple graphical coding).

U33 CONTROLLER:

- (+) - power input from batteries
- GND - power return to batteries
- D1 - output connection for a motor, paired with D2, higher & lower levels
- D2 - output connection for a motor, paired with D1, higher & lower levels
- A - output connection for low current uses, 4V output level
- D3 - output connection for a motor, paired with D4, higher & lower levels
- D4 - output connection for a motor, paired with D3, higher & lower levels

BOFFIN APP INSTRUCTIONS

Google Play Store



App Store



Go to the App Store or Google Play Store on your device. The most recent version of the Boffin app is available on iOS and Android, and may also be available on other devices. Visit www.boffin.cz/en for more information.

Search for 'Boffin'. Look for a page like the one shown here. Download the app, install it, and open it. Contact Conquest ent. if you have any problems (www.boffin.cz/en, info@boffin.cz).



CONNECT TO THE BOFFIN APP

Build any project from this booklet and turn on the switch (S1) that is needed to turn on the controller (U33). Activate the position on your phone and Bluetooth as well and open the Boffin app.

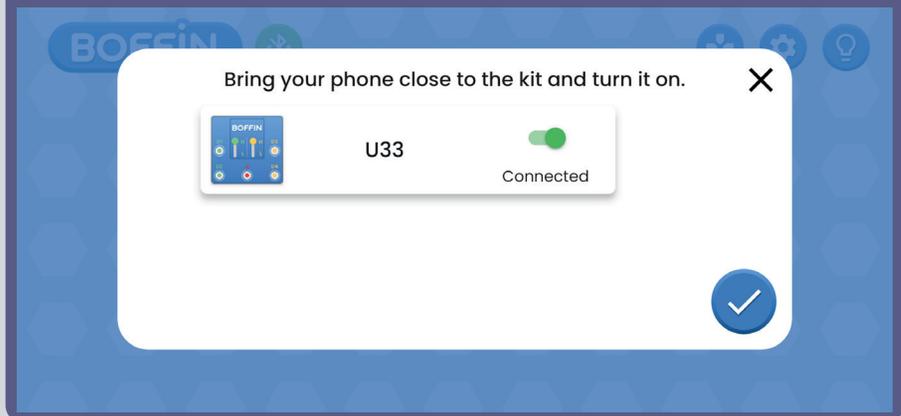
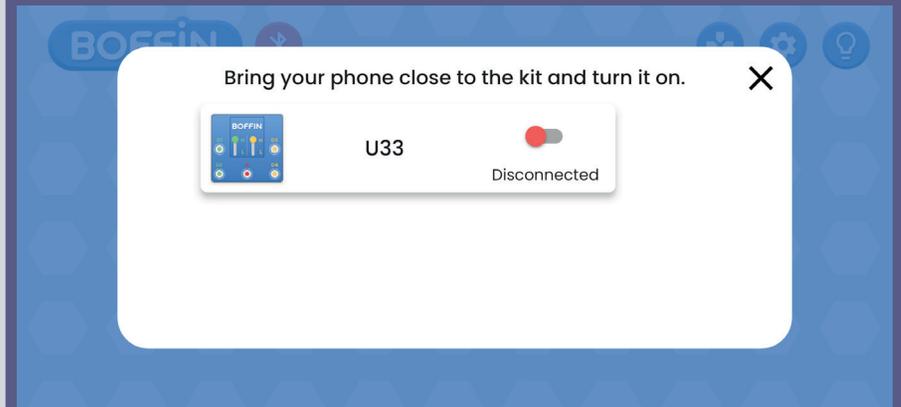


Make sure Bluetooth is turned on your device; If it's off, the app should prompt you to turn it on. Confirm in the bottom right corner and the pairing is done.



You are now ready to Control or Code.

Click on the red bluetooth icon and your phone will pair with the Boffin kit (via part U33).



Note: If you are connecting for the first time, your U33 driver will named SCCSCC or SCC.

To disconnect: Turn off the S1 switch or click the green Bluetooth icon on your phone and confirm Disconnect. This will disconnect your device from the U33 controller and someone else can connect.

To reconnect: Switch on your U33 controller using the S1 switch. Return to the app and click on the red bluetooth icon.

CONTROL

The easiest way to use your driver U33 is through the Control Panel, which can be found in the main menu under CONTROL and which serves as a remote control for the Boffin car.



1. You should have the Boffin app running on your device, the project built and the U33 driver connected.

2. Select CONTROL from the main menu and the Control Panel in basic settings.



3. You can click on the icon at the top right and the first of the drive modes will appear. Drive modes are described on the following pages (41).



4. Control panel in the basic settings is used for switching the LEDs on and off (by clicking on D1, D2, D3, D4 and A).

- 5 outputs for controlling your circuits: D1, D2, D3, D4 and A. Simply press the button to turn on/off the circuit output. Use these to turn the LEDs in your circuit on and off.
- D1-D4 have Higher and Lower Voltage Level Controls (typically 5V and 3V but varies depending on your battery voltage). Select Higher (H) or Lower (L) voltage to change the output voltage level. D1 & D2, and D3 & D4, are paired and must always be the same voltage level (H or L). Use H and L to change the brightness of LEDs in your circuit that are turned on.
- The A output is 4V but can only supply low currents, so it cannot be used to control the motor (M1) directly.
- You can Control & Code circuit paths independently or together. You can turn on all 5 circuit outputs (controlling 5 LEDs in this circuit) at a time or turn them on/off individually.

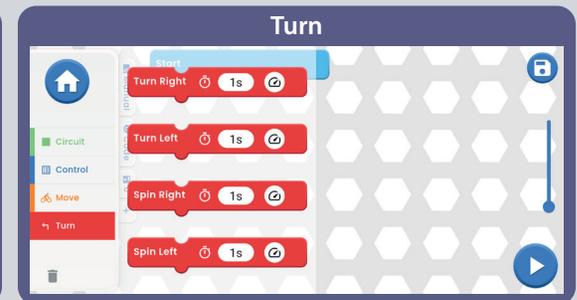
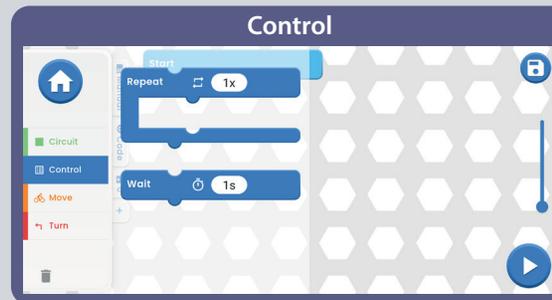
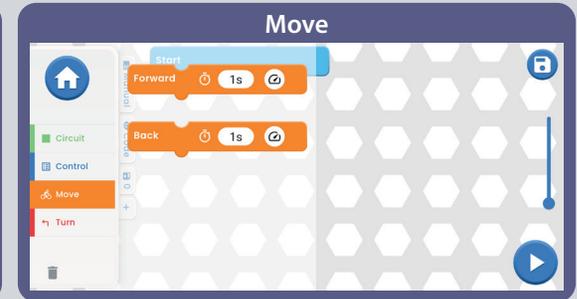
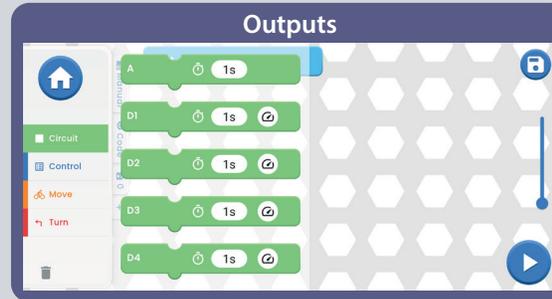
CREATE WITH BOFFIN

The Boffin app uses Scratch-like drag and drop coding to make it easy to program the controller. You can turn on lights, sounds, or motors, in any order or for different durations.

1. The Boffin app should be open on your device and your controller module should be connected to it as described earlier.

2. From the main menu, tap the Code button to get to the main screen with first command BEGINNING. With the Boffin app you can program sequences of actions for your controller and see them in action. Turn your device sideways – the app will

always be locked in landscape mode.



Bookmarks:

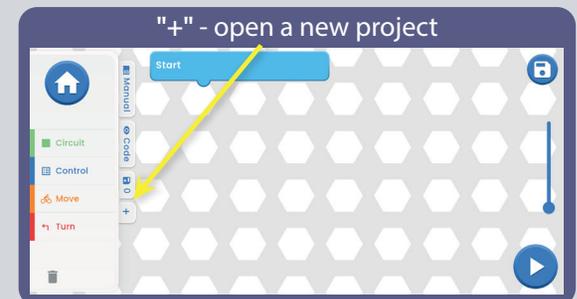
Manual - offer of all Boffin manuals. When you click on it, a small window with a "+" will open. Click on the "+" and select manual from the list. Manuals are downloaded from www.boffin.cz/en, so it may take a while. Confirm the blue arrow and the manual will open in a small window. You can scroll through the manual or enlarge the window in the upper left corner. Working in the window is not so comfortable as it is with printed manual.



Code - the text code for the commands which you created in the main field under BEGINNING.



Trash bin (command dragged towards the bin gets deleted)



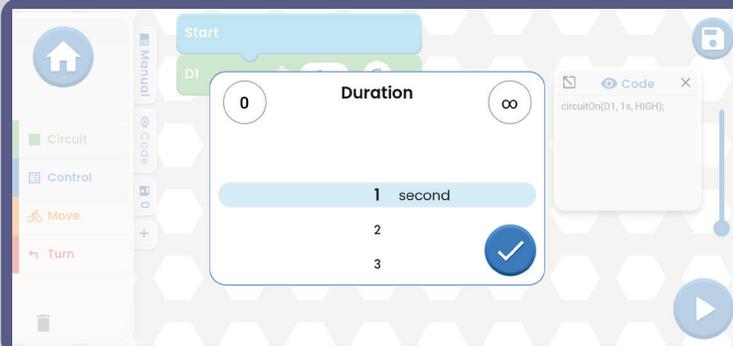
EDITING & SAVING BOFFIN

Boffin app screen



Main field - choose a command from the left menu OUTPUTS/CONTROL/MOVE/TURN and drag it under the command BEGINNING. Command will snap to it. For example D1 from OUTPUTS see picture.

Follow this procedure for all commands.



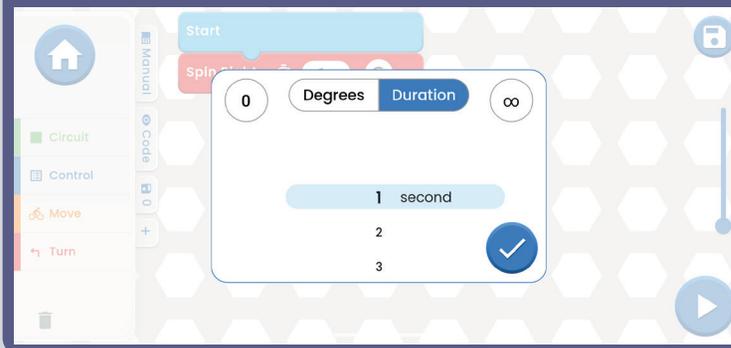
You can adjust the time and intensity on the D1 command by clicking on Time is in the range 1-999 seconds or you can use the 0 and ∞ button. Intensity is either Low or High.



Try adding more commands from the left menu. If you enter more commands than the screen size, you can simply scroll through the commands (just swipe your finger around the screen NEXT to the commands, not on them) or use ZOOM.



When you enter a command from TURN and click on the 1s time, a window will open where you can set not only the time, but also the degrees of turning (by clicking on Degrees or Time). The degrees are selectable from 0 to 360°.



TIPS: Inserting a command between commands - Click or example on OUTPUTS, hold down with your finger D2, point it between two commands where you want D2 to be inserted. Then you just drop D2.

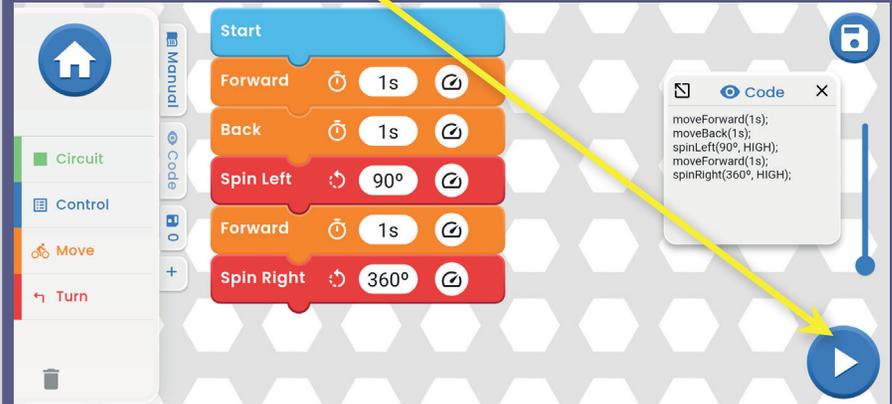
TIPS: Removing a command, that is inserted between other commands. Hold the command with your finger and pull it aside. The command will be detached and you can drag it towards trash bin, which is on the bottom left.

To save your programs

You can save the code at any time by clicking on the icon in the top right corner save icon. Just enter the project name and confirm with the green arrow.



Once you've completed the code (you have all the commands in it) and saved it, click the START button in the bottom right corner.



The whole code will run (lights will flash on the project on the kit, the car will drive, etc.). The kit will do exactly what you coded. In case you want to stop the code, just click on the blue square. To let you know what command is currently being executed, a black box will mark the command in the app and start counting down the time you set on the command.

Note: To program commands, you must be connected to U33 driver.

Tips: Select a command and change the voltage (H/L) of the U33 driver and the time for each command.

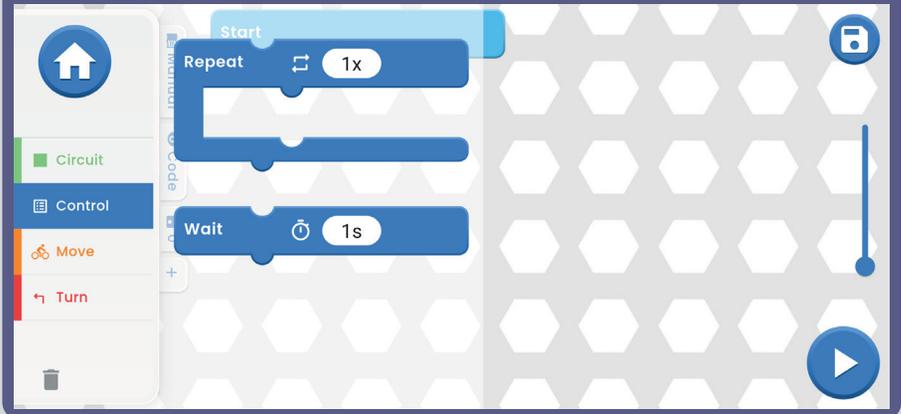
H (high = 5V) and L (low = 3V) output voltage levels apply only to outputs D1 to D4, not to output A.

INDIVIDUAL COMMANDS

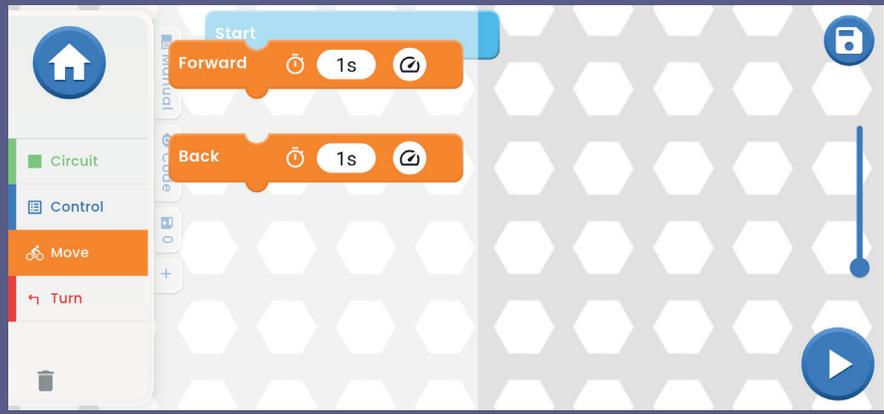
Outputs A - D1 - D2 - D3 - D4. The duration can be set for all of them. D1/D2/D3/D4 - the intensity (H/L, High/Low) can also be set.



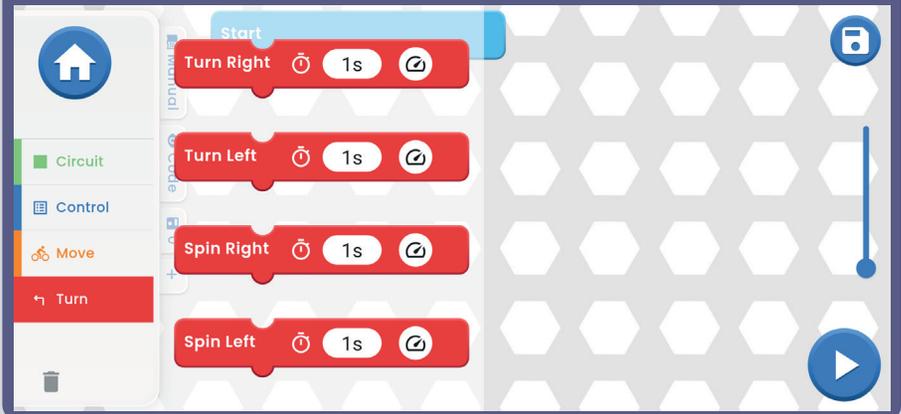
Control REPEAT - is used to make the commands inserted into REPEAT execute multiple times in a loop (the number of times depends on your choice). WAIT specifies how long to pause. To interrupt the repeat, press the blue square on the bottom right.



Move - FORWARD/BACKWARD For both commands the duration and intensity can be set (H/L, High/Low).

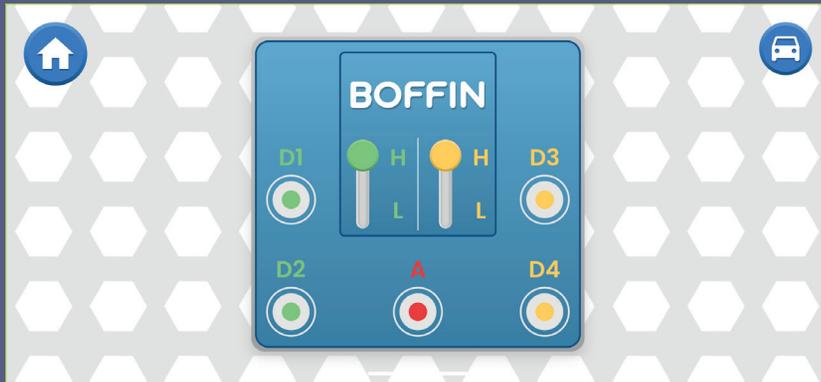


Turn - TURN RIGHT/TURN LEFT/SPIN RIGHT/SPIN LEFT. For all commands the duration and intensity can be set (H/L, High/Low).



DRIVE MODES

Main menu - CONTROL - Control panel and car icon in the top right corner.



Click on to open the first driving mode - COMMAND DRIVE.

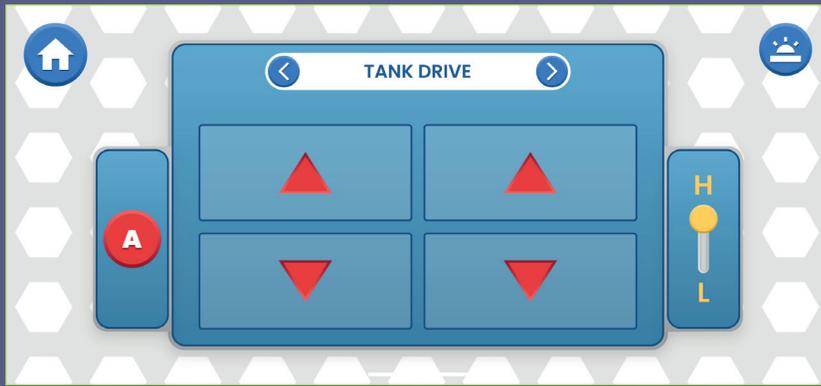
Command Drive - the easiest mode, best for getting started. Red Arrows - Forward/Reverse, Blue Arrows Right/Left, Green Arrows Turn right/turn left.



Top right button: Back to the CP (Control panel).

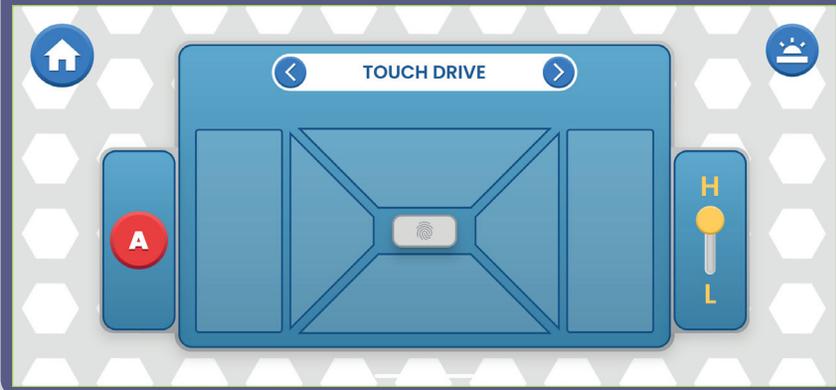
You can switch between Drive modes with the left and right arrow keys above the controls.

Tank Drive - a two-handed steering control that makes it possible to control the rear engines. Top arrows - press at once = drive forward. Lower arrows - press separately = turn Right/Left.



For all 3 modes you can control the speed (H/L, High/Low) and output A (this can be a light or horn depending on the project you build).

Touch Drive - a sensitive joystick-like controller that allows you to touch to control the movement of the vehicle (touch the center and pull in the direction you want to steer the vehicle). Put your finger forward on the white button and move it where you want to go.



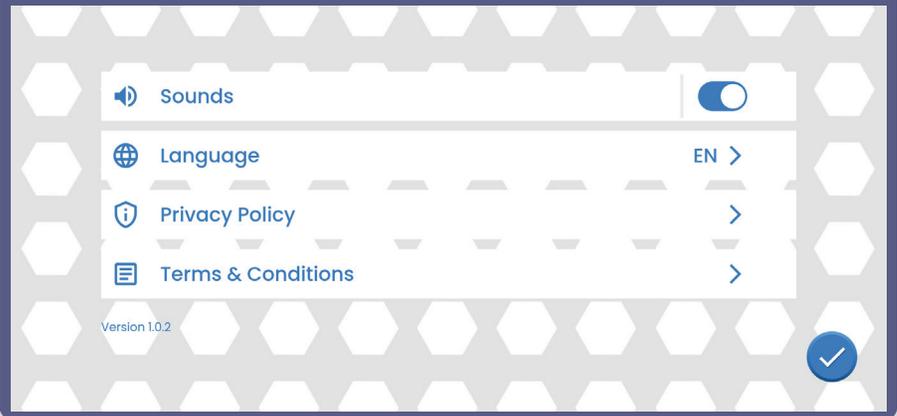
VEHICLE CONTROL WITH THE CONTROLLER (U33): Vehicle commands assume that D1-D2 outputs on the controller are connected to a vehicle's left motor (motor "+" or forward to D1), and that the D3-D4 outputs on the controller are connected to a vehicle's right motor (motor "+" or forward to D3). The A output on the controller is free to be used for sound, a light, or other functions.

APP SETTINGS AND TIPS

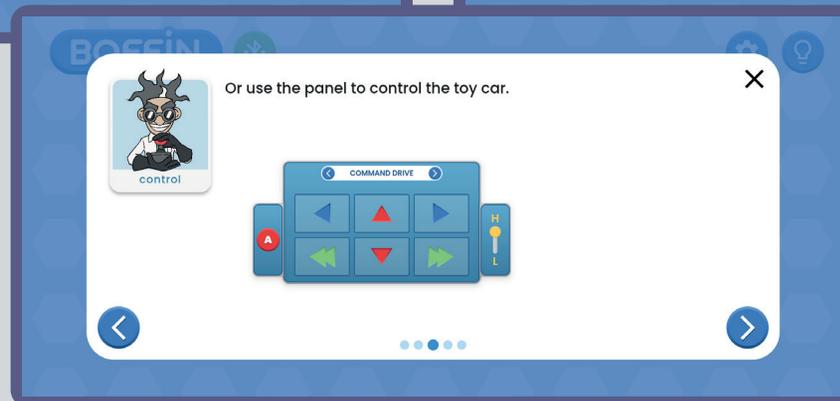
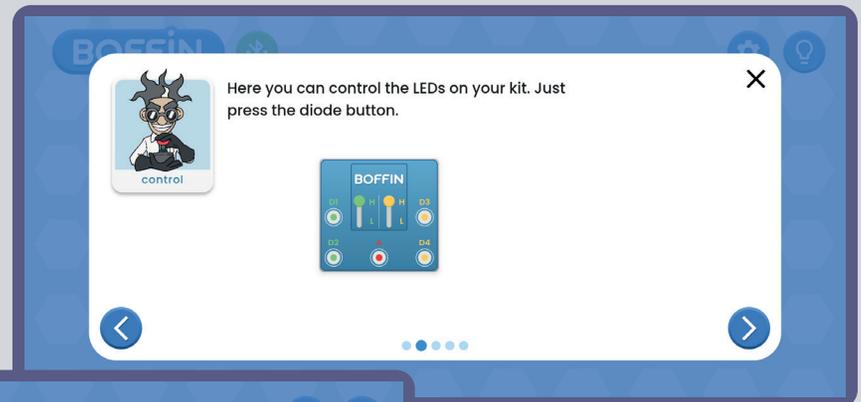
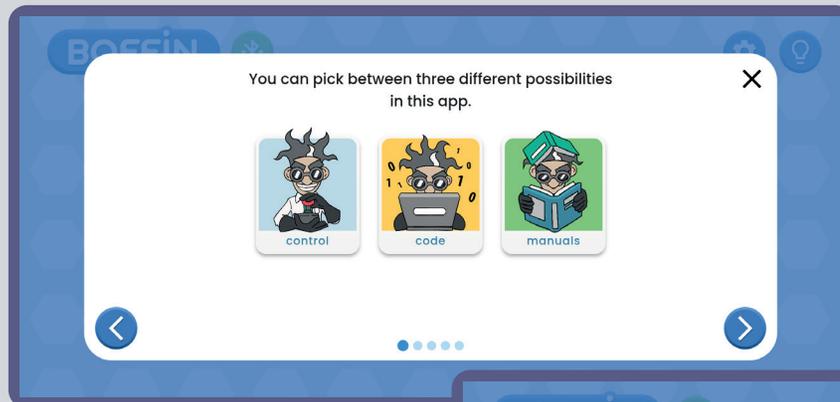
Settings - click in the main menu on the icon SETTINGS.



In the settings you can turn the sound ON/OFF, change the language, read the privacy policy and general terms and conditions.



Tips



DESCRIPTION OF BOFFIN APP COMMANDS

D1

Turn on D1 output (similar for D2, D3, D4) for the time duration shown and at the voltage level (H or L) shown.

A

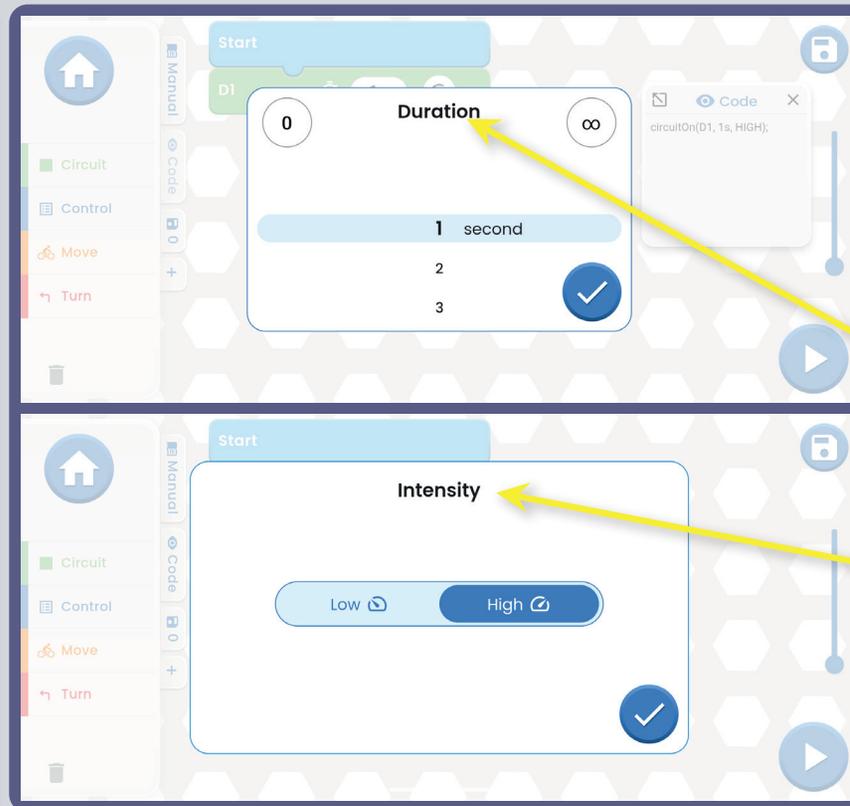
Turn on A output for the time duration shown.

REPEAT

Set up a group of commands to be executed for the specified number of times (1-100).

WAIT

Wait for the time duration shown before executing any more commands. Time units are roughly 0.1 seconds (varies widely, due to processing and Bluetooth delays). Value can be set from 1 to 100.



On the D1 command you can adjust the time and intensity.

The time is between 1-999 seconds or you can use the 0 and ∞ button.

The intensity is either Low or High.

VEHICLE COMMANDS WITH THE CONTROLLER (U33):

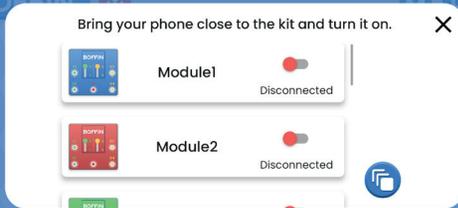
Vehicle commands assume that the D1-D2 outputs on the controller are connected to a vehicle's left motor (motor "+" or forward to D1), and that the D3-D4 outputs on the controller are connected to a vehicle's right motor (motor "+" or forward to D3). The A output on the controller is free to be used for sound, a light, or other functions.

NOTE: Turning on D1-D4 and A for a set time means the program will turn that output on, wait for that duration, then turn that output off before moving on to the next command. Set the duration to ∞ to turn an output on and leave it on (while the program performs other commands), then later set the duration to 0 if you want to turn it off later in the program.

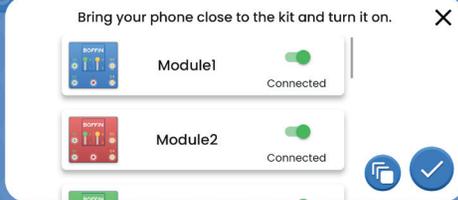
ADDITIONAL U33 MODULS

Login to multiple U33s (max 15):

When you click on the bluetooth icon, the app will display all U33s that are within range. Click on Disconnected and the U33 will connect to your app.



Confirm this step. If you click on Disconnected and there is not another U33 controller in range - nothing happens.



Login to multiple U33s - different view:



This is what the Control Panel looks like when there are multiple U33s (right icon).

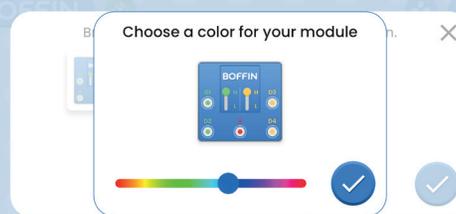


Click on the icon to see all U33s.



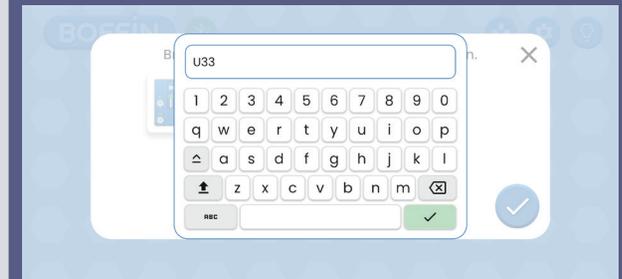
Change the color of U33:

You can change the colour of individual U33s. Click on the U33 module icon to open a selection bar colors. Confirm your selection with a check mark.



Renaming U33:

You can rename individual U33s. Click on U33 name and the keyboard will open. Confirm the new name.



NOTES

Build your own projects and send them to us at info@boffin.cz

CREATE YOUR OWN CHALLENGES

CREATE YOUR OWN CHALLENGES

FCC Regulatory Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

ISED Regulatory Compliance

This device contains license-exempt transmitter(s)/receiver(s) that comply with the EU measures. Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

RF Exposure Compliance

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

CAN ICES-3 (B)/NMB-3(B)

Electronic kit



Elektronická stavebnice



Elektronická stavebnica



Zestaw elektroniczny



Elektronikus építőkészlet



Boffin START 1



Boffin START 2



Boffin I 100



Boffin I 300



Boffin I 500



Boffin I 750



Boffin II Light



Boffin II 3D



Boffin II Green Energy



Boffin III Bricks

Components set up

Important: If any parts are missing or damaged, DO NOT RETURN TO RETAILER. Email us at: info@boffin.cz

ConQuest entertainment a.s.,
Kolbenova 961/27d,
Praha 9.
www.boffin.cz/en
info@boffin.cz

Note: A complete parts list is on page 2 in this manual.

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