Warranty and Do not forget.

Cebek educational modules included in the EDU serial offer several practices to analyse, experiment and to learn basic knowledge on the studied theme. Nevertheless, their function is not to make a mini-class on each theme, but to complete and to be used as basis, as well as to allow to experiment on the theoretical theme evocated by the teacher. For this reason, we suggest you to use modules form the EDU serial under the supervision and the direction of a teacher.

Cebek doesn't offer a consulting service as concern the theoretical or the operating principles concerning the theme deal with the module. It only offers a technical assistance regarding questions and problems coming from the circuit's internal operating mode.

All Cebek modules included in the EDU serial have a warranty of 3 years as concerning components and labour man. All damages provoked by external causes (from the circuit), as well as wrong connections or installations or due to an operating mode no indicated into the module's documentation won't be covered by the warranty. More over, all wrong or incorrect handling won't be excluded from the warranty. For any claim, you have to present the corresponding invoice.

To contact our technical department, you can send a message to sat@cebek.com, or a fax :Nº+34.93.432.29.95 or a mail to the following address: CEBEK, c/Quetzal, 17-21, 08014 Barcelona (SPAIN).

Rules and Identification of the EDU serial elements.

To make easier the identification and for a single rule as concern different practices and educational Cebek modules, all common elements will answer to colour code and to a shape.

Test Point. (TP).

It allows to connect oscilloscope's or multimeter extremities to read parameters relating to the practice. According to its colour, it will indicate that the Test Point (TP) is connected to the positive or to the negative of the circuit, as well as reads concerning current, voltage, load, etc….

TP. ⊕ circuit
Red

TP. ⊖ circuit
Black

TP. Tension
Yellow

TP. Courant
Blue

TP Without current or TP AC.
White

Conmutator / Switch.

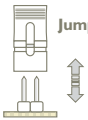
According to the colour of the switch, you can control the voltage, the current

Power supply
Red

Current
Blue

Voltage
Yellow

Logical
Green



Jumper.

It allows to close or open a signal or an electrical circuit

EDU-004

EDU-004. Electronic Soldering.

Before to start...

Before to start a practice, it is very important to carefully read its instruction manual as well as corresponding indications.

You have to do correctly connections in indicated contact points, otherwise measures depending on these connections will be confuses or wrong.

Do not make connections not indicated in the instruction manual to avoid to damage the circuit.
If the Led of the power supply "PWR" doesn't light on or if its function suddenly stops, you have to quickly disconnect the power supply for the device and check there is any short-circuit as well as the fuse's status.

Even if described practices can be done following instruction manual, we recommend you to use it under the supervision of a teacher who can advise and bring you a support (an help) concerning described concepts.

In the circuit, each practice will be delimited by a rectangle with the corresponding number. One or several experiment(s) can be reported and referenced to this practice.

Module's power supply.

The circuit is supplied at 9 V DC, even if it can accept voltage from 5 to 12 V DC. You have to use a laboratory stabilised power supply like the Cebek FE-103. The circuit's power supply is done through input terminals, identified with positive and negative symbols. Regarding the power supply connection you have to respect the indicated polarity. For the installation, we suggest you to place a switch and a 50 mA fuse on the positive input.

Module´s operating mode.

Once the module supplied, it will start a constant intermittence between the led 1 and the led 2. The intermittence speed will depend on C1 and C2 capacitors. If you are using capacitors with lower capacity, the intermittence speed will be higher. At the opposite, if capacitors offer a higher capacity, the intermittence speed will decrease. More over, if C1 and C2 have a different value, the intermittence will be asynchronous.

Required Material.

To make this practice it will be necessary:
.- A soldering iron for electronics, a "pencil" type or soldering station.
.- Cut pincers
.- Fixing pincers
.- Pincers
More over, if you already have a tool to support the printed circuit board and components, you can se it.

Bibliography.

- On Google: Soldering | Soldering station.
- On the internet: www.fadisel.com | www.jbc.com | www.panavise.com/f/vises/vises_cbholders.html

EDU-004. Electronic Soldering.

The Electronic Soldering.

The electronic soldering offers two essential functions, to physically fix a component and its electrical conductivity with the rest of the circuit.
To obtain these two goals, you have to use the combination between a metal with a low melting point (between 200° and 400°C) and a soldering iron to heat it.
When you apply the soldering iron on the metal, this one (who is normally in solid state) will be liquefied to be distributed along the surface prepared for this operation. As it is a dense liquid, it will remain around the track or the hole on which it is applied without overpass on the rest of the circuit.

The Tin.

The metal used for the electronic soldering is an alloy, basically composed by tin, which guarantees a correct electrical conductivity. It is economical, and its melting point is placed on a threshold allowing to use basic soldering irons, avoiding to naturally reach the temperature for the sate change and it doesn't require voluminous or powerful melting apparatus.
For other applications, there are conductors metals, like the gold, with optimal technical characteristics and answering to higher requirements (for space or military industries, or microprocessor cores, etc…)
The tin used in electronics is supplied in wire format, around coils with different sizes. It has a colophony cover making easier its handling and with anticorrosion function.
There are different types of tin, for different applications, like electrical soldering, or plumber soldering; but they are not suitable for electronic applications, due to its different composition and fluidity.

Tin coils

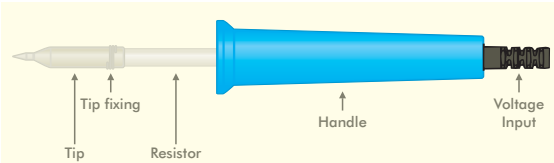
Soldering types.

The soldering can be manual or by machine, this one being standard or by SMD.
The automatic soldering in SMD, where it is necessary a robotised machine applying mechanism which collects components (normally placed on roll) and place them on a determined location (coordinate) on the circuit, previously impregnated with paste for tin in specific points. Finally the machine apply heat to melt the paste and connecting components with the circuit. This method is used for important quantities.
The standard soldering using machine, with components different than SMD, requires a manual components insertion, where finally and through wave system, they are soldered. This system is used for medium or small quantities.
Finally, the manual soldering requires a manual components insertion and a soldering iron for soldering. It is used for small quantities, normally associated to small production lines or prototype.

EDU-004. Electronic Soldering.

The soldering iron.

Among soldering irons, we can identify three different types; the soldering iron, the soldering and/or desolder station and the SMD soldering station. All of them carry out the same function, to allow to solder the component on the circuit printed circuit board. The selection, among these three possibilities, is in accordance with the use.
For laboratories, small assembling lines and for professional uses, it is generally selected the soldering station and/or the SMD soldering station, according to the used component. For punctual uses, and without any exigent or continuous performance, it is recommended to use a standard soldering iron, also named “Pencil”, which is the most cheaper and portable.
Standard pencil soldering irons are classified according their power, from 6W to 30W, and they can be basically divided in 5 parts.
It is more important to emphasize the soldering iron tip, the element the more exigent and where the manufacturer's technology has to be highly efficient. This one has to distribute the heat concentration just on the tip, and it has also to support the maximum temperature of the apparatus, to maintain a tip's life as long as possible, and of course to insure the intact maintaining of its technical characteristics.
The difference between all manufacturers is basically concentrated in this point, the answer of the heat applied to the tip and its life cycle. Few companies obtain an excellent qualification.
Each soldering iron allows, with different support systems, to substitute the used tip by a new one, or to adapt different diameters to adapt the soldering iron to required soldering operations. The manufacturer offers standard tips and long duration tips for professional applications.
The other basic element of the soldering iron is the resistor, charged to transform the electrical current to heat and to drive it up to the tip. Its power will vary according to the model, higher the resistor is and lower the tin's smelting time is and lower the heat loss is on the tip between successive soldering operations.
The voltage input to the solder can be with a direct connection to the mains (230 V) or through a connector to the soldering station; in such case, the used voltage has to be 12 V DC.



Soldering iron parts

The soldering iron maintenance is essential to guarantee a perfect soldering, as well as to extend the life duration of the tip. You have to avoid shocks on the resistor or on the tip itself, and to weekly and carefully clean it, removing excess and accumulation of tin and “resin”.
The cleaning operation has to be always done when the soldering iron is at its optimal operating temperature, washing the dirty tip part with a wet sponge or with similar item. Both accessories have to be especially prepared for soldering irons.

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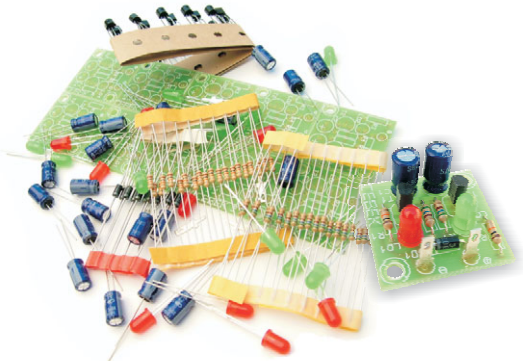
EDU-004. Electronic Soldering.



EDU-004

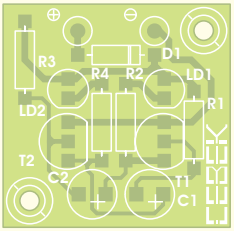
The module EDU-004 introduce and indoctrinate the student to the electronic soldering, offering a specific information to the tin's characteristics, description of the soldering iron, soldering techniques, practical data for the professional user, etc… It is composed by 10 printed circuit boards with necessary components to assemble auto-oscillators circuits composed by two leds. Printed circuit boards includes a mask to make easier the first soldering operations, and serigraphy to identify the components' location.

- **Introduction.** Specification of different elements of the electronic soldering, most popular methods, tin alloys , etc..
- **Soldering Iron.** Types of soldering irons, maintaining, parts of the standard soldering iron...
- **The Circuit.** Description of the practice circuit, functions...
- **Elements.** Work desk, necessary tools, preparation of the material...
- **The soldering.** Description and processes of the electronic soldering. Techniques, advises and drawing.

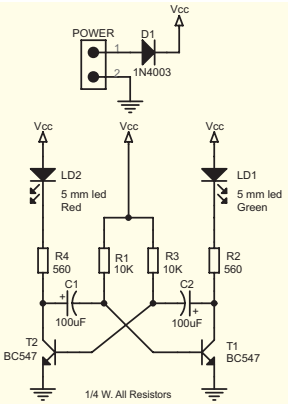
Soldering Practice

The soldering practice includes a board composed by 10 identical circuits' auto cut and components to assemble them. See the circuit electrical drawing and components map to easily found their value and their location on the circuit.
The end-user has to assemble and to sold these 10 circuits, the practice of this repetitive process will insure you the initiation and the improvement concerning the soldering technique.

Practice Drawings.



Components indication.



Electrical Drawing

Step 1. To prepare the material.

Firstly, you have to control the raster of the components present on the circuit, as well as the acquisition format. For instance, if the resistors' location is supplied in a 15 mm raster or at the opposite in 10 mm (as the supplied one in this practice).
It will be necessary to cut tem to a suitable size. There are different tools specially designed for this function, even if generally this preparation is manually done.
Cut or standard pincers, tin and soldering iron as well as a wet sponge will be necessary tools to start the soldering. A soldering iron support will be highly recommended to avoid burns o accidents due to a lack of fixing when it is useless.

Step 2. To remove the circuit from the panel.

To cut and remove several circuits, you have to slightly press in opposite ways the circuit to remove and the following; then you could easily withdraw each piece.

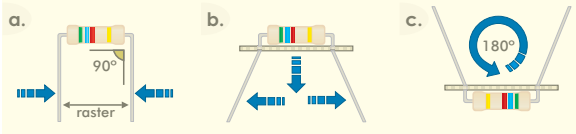
Step 3. To select components and to insert them.

Once inserted on the circuit, each component projects a determined height on the circuit's basis. Indeed, a diode or an integrated circuit don't have the same height than a capacitor or a terminal. In order to avoid any disturb during the soldering process and to use assembly tools, the component insertion won't be done in anarchical mode but

Step 3. To select components and to insert them, (2nd part).

according to the projected components' height.
Usually, the soldering process is started with integrated circuit and their basis, then components with lower height like transistors, small capacitors, leds, etc….and successively till you complete the circuit with higher components.
Concerning the manual soldering, there are several tools to help you to maintain fixed components on the circuit till you finish the soldering, leaving free both hands. Ifyou don't have any tool, you will be obliged to use alternative fixing methods.
Some components like resistors allow, through their opening terminals, to be turned without falling and then to be soldered. Others components require to be obligatory fixed to the board, for instance, using specific pincers…

Components preparation and auto fixing.



Step 4. To verify the soldering iron temperature.

The soldering process has to be start when the soldering iron reaches the maximum operating temperature. A practical way to check it is to move closer the tin to the tip and if it melts without problems, that means the soldering iron is ready to be used.

Step 5. To clean elements.

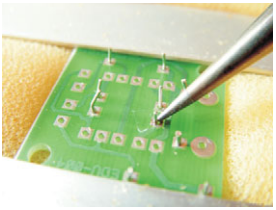
Before to start this process, it is highly recommended to check the board side where components have to be soldered. For industrial circuits, containing a previous tin bath, you only have to brush the surface to eliminate any impurity or tin wire, invisible at the sight. For home circuit, a previous cleaning with alcohol or solvent will make easier the soldering operation.
Regarding the soldering iron tip, before to sold each component you have to check the its cleaning state. If you have an accumulated excess of tin or resin, you have to clean it washing the dirty tip part with a wet sponge and with the tip as hot as possible. This operation has to be constantly and frequently done till you finish the circuit; otherwise it can be produced failures on the soldering or problems on the soldering process.

Step 6. To start the soldering.

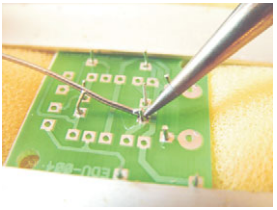
The soldering iron tip has to be placed on the union of two elements to solder, allowing the heat distribution between both. You have to control the heat application; this one has to be enough to heat both components, but not excessive, to avoid to damage the component. If you use pincers to support the component's pin, you have also to take in account the temperature loss due to the pincer's absorption.
When both elements are heated, without removing the soldering iron, you have to apply the tin on the surface to solder, avoiding to touch the tip. The tin will be melted and flow between both elements to solder, being distributed on the surface. If this surface is important (the hole as important as the pin), the tin may have some

Step 6. To start the soldering, (2nd part).

difficulties to be completely distributed, due to a lack of heat on it. To solve this matter, you have to slightly move the soldering iron to supply heat to the rest of the surface and then make easier its application and complete tin cover.



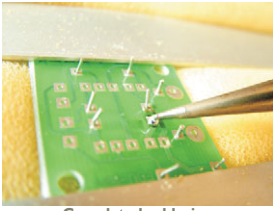
To heat both parts



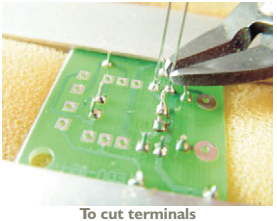
Tin application

Step 7. To finish the soldering.

When you apply the tin between the two surfaces, it will appear a half sphere with different size, according to the application surface. When you completely cover the area reserved to the soldering, and obviously the part in contact with the PCB, you have to remove the soldering iron and to wait for the complete tin's cooling.
Do not remove the soldering iron before the complete tin's cooling otherwise you can



Completed soldering



To cut terminals

provoke a defective soldering named “Cold soldering”.
After the tin's cooling you have to cut the pin excess of the component using cut pincers specialised adapted to the electronics. You have to cut at approximately 1 myriameter on the tin top.

Troubles and Problems in the soldering (Advices)

1.-You have to solder only when the soldering iron reach the operating temperature.
2.-The soldering iron tip has to be maintained free of tin excess and/or dirt.
3.-The tip has to be placed between the two elements you want to solder, on the union point between both.
4.-The tin has to be applied to the surface you want to solder, if you only put it on top, it could happen a dab soldering.
5.-Do never solder, firstly accumulating the tin on the tip and secondly pouring it on the circuit (PCB), in order to avoid a cold soldering.