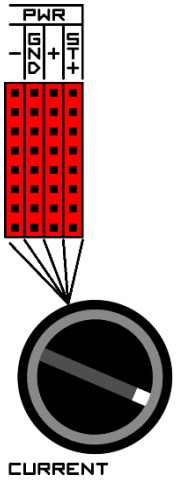
I/O-section consists of four 3,5mm TRS-connectors, which are used to feed signals to and from 4060. **When nothing is patched, no signals are connected to the connectors!** You can patch any patch point to the connectors with jumper wires or with components! TRS refers to Tip, Ring and Sleeve, and the connector is best known from headphones. The connector is stereo, so you can use it to transport two signals. **Tip** usually connects to **left channel**, **ring** to **right channel** and **sleeve** to **signal ground**.

You can connect the LINK SLEEVE jumper in three modes: **a.** "Link to –" will make the device appear as unipolar, with signal swing from 0 to 9 volts. **b. "**Link to G" will link SLEEVE to virtual ground making the device appear as bipolar with +/- 4,5v range. This mode is suggested when connected to **Eurorack** or other synths. In this mode the device also reacts more easily to incoming signals. **c.** If you disconnect the jumper you can patch a third signal to SLEEVE. In the last case the signal connected to SLEEVE will "bounce" the ground up and down, thus affecting all of the possible 8 signals in the 4 connectors. In this mode the signal swing is +/- 9v. Which brings us to the fact, that before connecting Olegtron 4060 to ther devices, **make sure that the device can stand the voltage!**

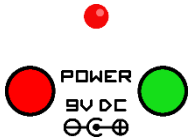
Please note! If you use a mono plug, the connector's RING connects to SLEEVE. When using a mono plug, signal is connected to TIP.



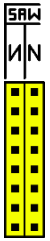
PWR-section is what makes the CD4060 chip behave in a more interesting way. Adjusting the CURRENT knob sets the amount of electrical current provided for the chip, as would happen with a **weak battery**. When the current is not adequate, the efforts made by the chip - oscillating and dividing - start to show. Add components to the patch board and you can hear how they load the circuit, each in a different way. If the device halts, dial the CURRENT up or remove the last component.

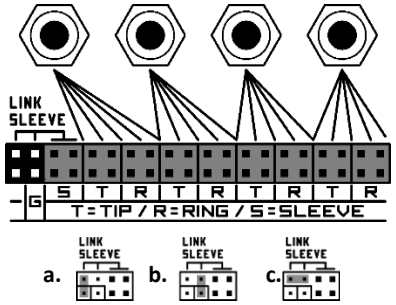
Battery voltages are available in - and +. In the MK2 version there is a buffered virtual ground, GND, which gives out a voltage in the middle of the operating voltages. More in the I/O-section. The limited, i.e. starved, voltage is available in ST+. You can use ST+ as a kind of a general output of the device's inner workings.

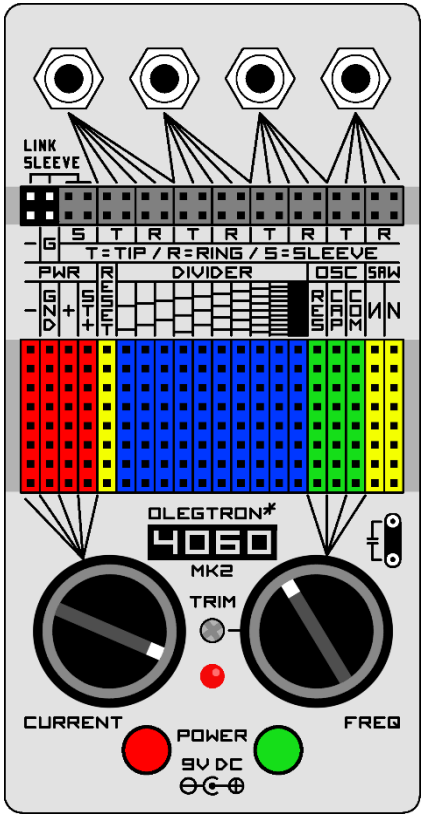
There is a 180 ohm resistor in series with the power supply, so the system never gets full power. This means you cannot get an absolute clean signal from the box. On the positive side the resistor makes it safe to plug components around the patch board. It is advisable however to **check capacitor polarity** and **voltage rating** before patching to **PWR-section**.



POWER switches are wired in a three way configuration: The red one is a locking type on/off switch, and the green one changes the state momentarily **off > on** and **on > off**. You can also use a wall wart to power the device. The nominal voltage is 9v, but the device will work with voltages from 3v to 15v. **When using larger voltage input, the device also outputs larger voltages!** When you plug in an external power adapter, the battery gets disconnected. The power LED shows the state, and will get dimmer and start to flicker when battery is about to throw in the towel.



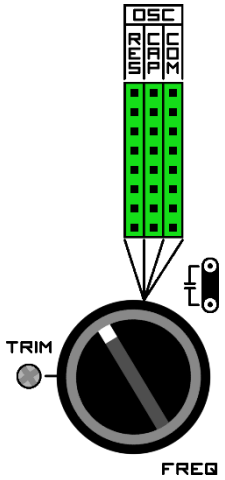




SAW-section integrates the popular "7-bit saw" module of the original 4060. It's now buffered and inverted, though. The SAW section takes 7 of the highest DIVIDER frequencies and converts them into a rising sawtooth wave, and it's mirror image. The waveforms are far from ideal, but provide a different timbre/good starting point for an LFO. When you patch components to the patch board, the SAW-waveforms will change.

Olegtron 4060 is a device anti-theoretic by nature, but you might still want to eyeball this paper through. Best way to learn is by experimenting, though. If things don't work out, try again! Please share your findings and ask for help at **www.olegtron.com/forum**

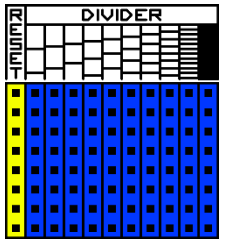
Olegtron 4060 is a simple device - more of a design concept. It's based on the datasheet example circuit of CD4060, a CMOS logic chip from the lovely 4000-series.



OSC-section gives you access to the base frequency that affects the **pitch** and **tempo** of the whole system. The frequency is adjusted by turning the FREQ knob. By adjusting TRIM with a small screwdriver you can limit the frequency range and look for sweet spots at the upper threshold where oscillation just barely happens.

You can also use external components to control the frequency: If you want to **speed up** the oscillator, patch a **resistor** between RES and COM. Hot tip! Try an LDR for light/gesture control! If you want to **slow down** the oscillator, patch a **capacitor** between CAP and COM. The metal sockets next to the knob double the CAP and COM, so you can patch a capacitor there for more permanent slowing.

You can also **output** signals from the OSC patch points when you need high pitched sounds. The waveforms in OSC section are also different if you need a change of timbre. Since we are in the center of the action here the OSC patch points are quite sensitive. So, if the oscillation stops, try patching with a large resistor to avoid loading the oscillator.



Since the OSC section is so delicate and vulnerable, you can feed **external signals** into the patch points to sync/override the internal oscillator. Try linking SLEEVE to GND and adjust CURRENT for better response. You can also patch signals from 4060 itself for some internal modulating. Start with a small capacitor from DIVIDER to RES.

DIVIDER-section provides the nominal **outputs** of the CD4060 chip. But worry not! In case of Olegtron, the outputs can be used **as inputs** too, sensititvity depending on the setting of CURRENT and the components used. This is also a good area to start plugging components to alter the sound.

In divider there are 10 divisions derived from the oscillator base frequency. In audio range the outputs are perceived as different octaves of square wave signal. In low frequency range the signals at the outputs appear as voltages changing state between high and low, each output at half the tempo compared to the previous. Please note that for some reason there is a one octave gap, i.e. a subdivision missing before the lowest three DIVIDER outputs.

When you input a positive signal to RESET input, it will reset all DIVIDER outputs to low state and stop the base frequency oscillator. When the input signal goes back to low, oscillation starts again, and the divider begins to count. If you want the reset input to just reset the outputs, but keep things running, patch it with a small capacitor!

This page will go through some features of the basic electronics component set provided with your Olegtron 4060. There's not much electronics theory here, rather just thoughts of how the components could be utilized. All possibilities are not covered here - it's all about experimenting! If something does not work, try something else!

Jumper wires are normally used in electronics prototyping. They are flexible conductors covered with isolator and equipped with pins in the ends. The main idea of a conductor is that it lets electric current flow through theoretically freely. The isolator protects the conductors from touching each other and potentially causing problems. They are handy for sure, but when it comes to using with Olegtron 4060 they are a bit dull. Also short circuiting two patch points might halt the whole device, which is a bit of a nuisance. There's a whole world of components out there, so why not use them!

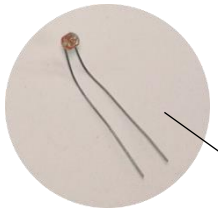
Resistors are a lot more interesting. Their function is somewhere between conductor and isolator. They let electrons flow, but at slower rate. This property is called resistance, and it's unit is ohm, Ω. The less resistance there is, the more freely electric current flows through. Resistors' values are usually hundreds, thousands (kilo-ohm, kΩ) or millions (mega-ohm, MΩ). The value is color coded to the body of the resistor with a set of stripes. The resistors in Olegtron 4060's component set are further color coded with spray paint to make patching easier. Below is a list of the resistors provided:

Brown	1 kΩ	brown-black-black-brown-brown
Red	10 kΩ	brown-black-black-red-brown
Orange	100 kΩ	brown-black-black-orange-brown
Yellow	1 MΩ	brown-black-black-yellow-brown

Resistors are quite handy in patching your 4060. First of all they limit the current going in and out of the device, so you can limit the strength of the outgoing or incoming signal by patching it with a resistor. A good approach is to start with a larger resistor, and if there is not enough effect, change it to a smaller one.

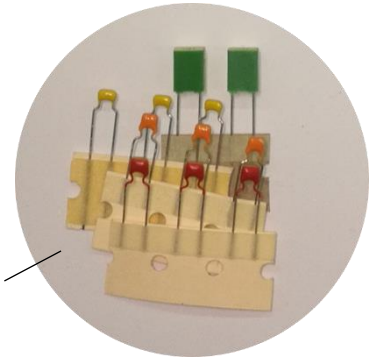
You can also use resistors to connect different patch points together without short circuiting them. When you connect, say two DIVIDER patch points together with a resistor, they start to kind of compete with each one, and that will affect the whole system.

You can also mix several signals together by patching them to the TRS jack with resistors. Use different resistors for different weight in the mix. Resistors can be used in other ways too, such as forming voltage dividers, or in passive filters. A web search will quickly tell more!



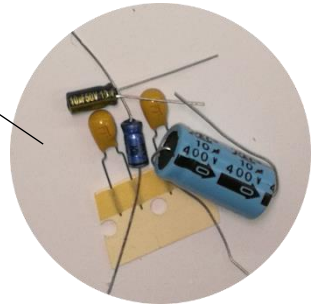
LDR, Light Dependent Resistor is a very useful component. Like the name suggests, it's resistance changes depending on light. If the component is in complete darkness, the resistance is some megaohms, and in bright light only some kilo-ohms. Patch the LDR between OSC: RES and COM for frequency control or between PWR: + and ST+ for current control. Or between DIVIDER patch points etc.

Capacitors are components, which have the ability to store energy in electric field. This property is called capacitance, and it's unit is Farad, F. Usually capacitor values are fractions of a Farad ranging from trillionth (picofarad, pF), to billionth (nanofarad, nF) and millionth (microfarad, µF). The capacitors provided with Olegtron 4060 can be roughly divided in two: small and large value. Small capacitors are also spray painted for ease of use:



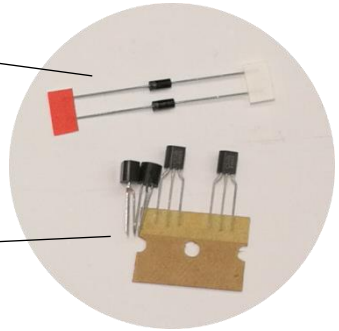
Red = 1nF, orange = 10nF, yellow = 100nF and green = 1µF.

The small capacitors can be used to control the frequency of the oscillation: you can patch a capacitor between OSC: CAP and COM to slow down the whole device. If you want to slow the device down more permanently, you can use the small sockets next to FREQ potentiometer. You can also connect a capacitor from the DIVIDER to OSC section for internal frequency modulation.



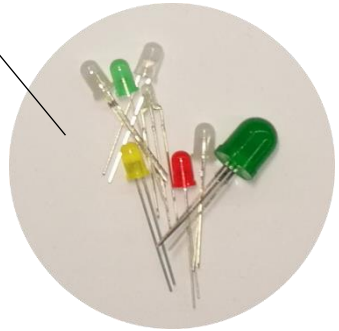
The small capacitors work fine in general patching, but the larger ones have more effect. The usual effect you get from the large capacitors is a sweep, which originates in the charging and discharging of the component. You can achieve sweeps by connecting two DIVIDER patch points together, but also by connecting the other leg to PWR-section.

If you connect a large capacitor between PWR – and +, you can filter out some harshness from the sound. You can also use the capacitor with POWER switches: when you cut the power, the capacitor discharges and causes a kind of a decaying sound.



Diodes are semiconductors that let current flow only to one direction. When you patch a diode between two DIVIDER patch points, they will start to compete, but only to one direction. Diodes also have a threshold voltage when they start to work. This means, that when you limit the CURRENT enough, diodes conduct at times only. Diodes can also be used to mix signals, a bit like with resistors.

Transistors are another group of semiconductors. They can be thought of as electrical switches, which let current through only when they receive a control current. In the provided BC547 and BC548 transistors the control input (base) is the center leg.



LEDs, a.k.a. Light Emitting Diodes, are a special group of diodes: they shine light when conducting. This is really handy when patching 4060: you will see the LED blinking, and you can simultaneously hear the difference in sound. LEDs also have a threshold voltage, which depends on the color. So different LEDs start to conduct at different voltages. Some of the LEDs have multiple legs internally connected to different colors, so there's a lot of functionality in one shiny little package.

And that's only for starters! Get some more components and try them out! When you find something interesting or have a question to ask, please go to www.olegtron.com/forum