Welcome to the Reaktor 4 Demo!

What is Reaktor?

REAKTOR 4, the award-winning modular sound studio, is the ultimate tool for sound design and music production. That's a pretty big claim, but we're convinced that REAKTOR lives up to that promise.

REAKTOR 4 lets musicians and engineers design and build their own instruments, samplers, effects and sound design tools. You can build any music device that your computer can handle (and with a modern computer, that's a very powerful device!). You can even combine instruments to create a multilayered synthesizer or advanced effect laboratory.

REAKTOR 4 is also a world-class studio right out of the box – its Library includes dozens of exceptional instruments and effects and the online User Library contains more than 1,200 user creations.

Purpose of this guide

This tutorial will show you how to build your own instruments in Reaktor, step by step. In the process of building a simple synth, you'll get a glimpse of the power and versatility of Reaktor 4.

Reaktor terminology

Before we can get our hands dirty building something, it's important to understand a few basic things about Reaktor.

Module: A module is the most basic Reaktor building block. Some modules are really elementary, such as a simple adder or multiplier. Other modules are quite complex, such an event table that can be used to store or sequence information. Some modules make sound, like the oscillators and time-stretching samplers. The modules also include a wide range of filters, and several sorts of delays, distortions, shapers, and more. You can't look in the

structure of the modules, but you can change their properties when appropriate. For instance, you can adjust the maximum delay time on the delay modules, or the size of the event tables. Even user-interface elements, such as knobs, faders, menus, and level meters, are elementary modules.

Macro: A macro is an encapsulation of modules or other macros. Macros form the heart of Reaktor's hierarchical structure. There's no limit to how many macros you can have stacked inside each other, nor to the complexity of a single macro. Macros make it easy to build up complex instruments from pre-built parts. We'll primarily use macros when building our example synth. It's possible to contain an entire oscillator or filter section within a macro, for instance.

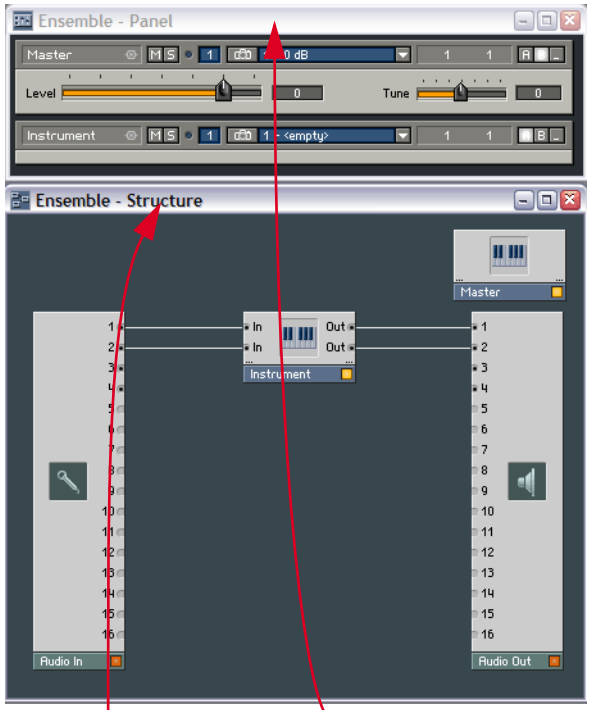
Instrument: An instrument is something that you can play. Examples of instruments include a synthesizer, sampler, delay effect, sequencer, drum machine, etc. An instrument can contain modules, macros, or even other instruments. Reaktor lets you easily set the polyphony of each instrument, from one up to 1024 voices! Each instrument can respond on a certain MIDI channel, so you can set up complete multitimbral arrangements within Reaktor. You can store snapshots with an instrument. A snapshot is a patch or preset or a setting or a sound or whatever else you want to call it. Each instrument can have multiple banks of 128 snapshots, and Reaktor lets you randomize and even morph between different snapshots.

Ensemble: The ensemble is the highest-level structure in Reaktor. You can only connect instruments together at the ensemble level. Ensembles also have snapshots however, and when you recall an ensemble-level snapshot, then all the instruments contained in that ensemble will automatically switch to the correct settings.

Building in Reaktor

Start Reaktor and choose New.... from the File menu

You should see two windows like this:



The top window is the ensemble **panel** and the bottom window is the ensemble **structure**. The panel window is where you actually control your instrument with knobs and faders, etc, and the structure is where you build things by connecting modules and macros and instruments with wires.

In the structure window, we can see a block of sixteen inputs and a corresponding block of sixteen outputs. If your soundcard has mutiple ins and outs you can easily connect instruments to the appropriate inputs and outputs.

Even though you can't tell by looking only at its structure, the instrument creatively labelled "Instrument" is empty. The Master instrument offers tuning and volume control over all instruments in the ensemble.

Each instrument has corresponding panel and structure views. We can see that our "Instrument" instrument is empty since there are no controls in its panel view. Likewise, we can see the the volume and tuning controls of the Master controls.

Splitting the structure and panel views lets us keep the control panels of our instruments clean, without needing to worry about wires or structures. Snapshot selection, MIDI channel selection, polyphony settings, and solo and muting is also controlled directly from the instrument panel titlebar.

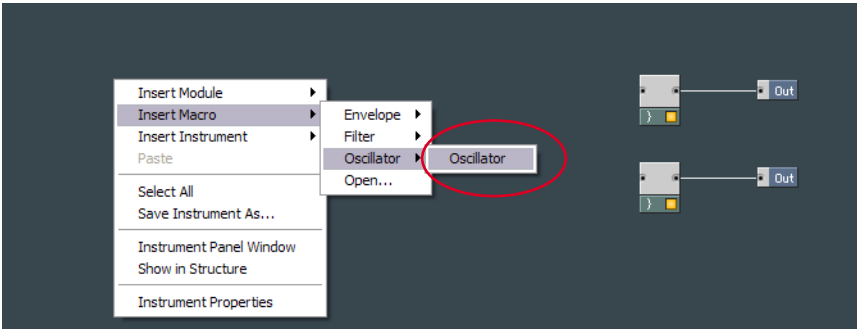
Double-click on the "Instrument" instrument to open its structure

You should notice that the structure of our supposedly empty instrument isn't quite empty. You'll see a pair of inputs, outputs and "}" modules. Every time you add an input module, the instrument (or macro) will grow another input, and likewise for the output module (except a new output would grow instead). For instance, if you wanted an instrument with seventeen inputs and six outputs, just insert seventeen input modules (or copy and paste them) and six output modules. Each module can be named, and the name will show up both inside and outside the instrument.

The "}" modules are called audio-voice combiners. If you're making a monophonic instrument you don't have to worry about them. But we're going to make a polyphonic synth so they're important. All the modules to the left of the audio-voice combiners will be polyphonic, and all modules to the right will be monophonic. This way we could insert a monophonic filter inside a polyphonic instrument, and have control over the CPU use and signal flow. If you don't understand the audio-voice combiners don't worry about it right now, since this is actually an advanced Reaktor topic.

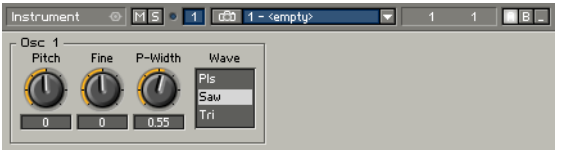
Add an Oscillator macro

Right-click (PC)/Control-click (Mac) to select the Oscillator macro from the menu as shown:



Reaktor 4 ships with almost three hundred different macros; in contrast, this demo ships with three. We'll be able to build a pretty capable synth with these three, however. Imagine what you can do with three hundred!

Now that you see the oscillator macro sitting happily in the structure, take a look at the instrument panel above. It should look like this:

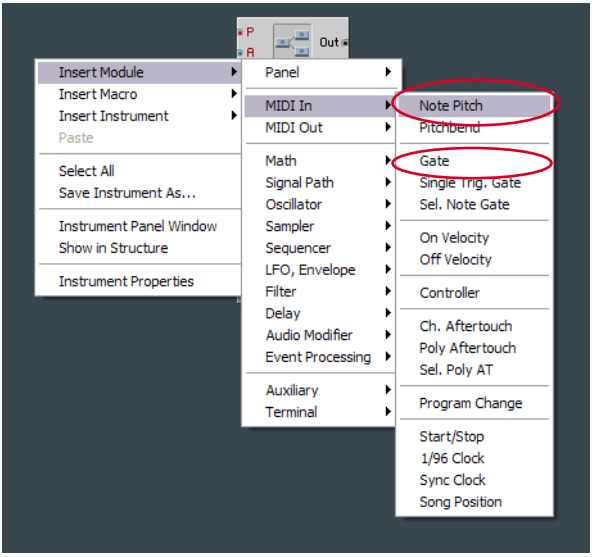


A macro can contain any type of module, including user-interface elements like knobs and lists, such as you see here.

Our synth still doesn't make a peep - let's connect it now!

Add MIDI control

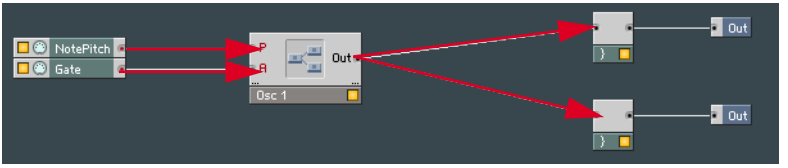
Right click anywhere in the background of the instrument structure to select a MIDI Note Pitch input, as shown:



Now add a MIDI In -> Gate module (two below the Note Pitch module you just added).

Connect the Oscillator to the output

Connect the basic synth as shown below. To make the wired connections, simply click once on the source port, then once again on the destination. You don't even need to hold the mouse button down while making a connection.

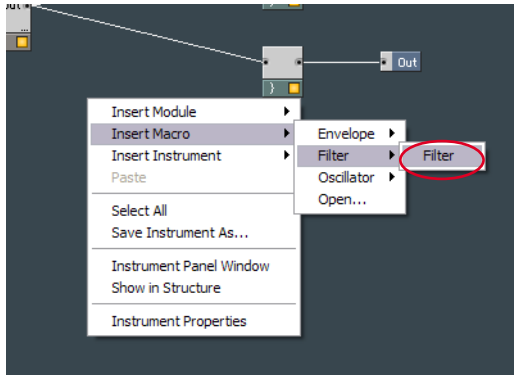


Now you can play the synth with a MIDI keyboard! If you don't have a MIDI keyboard hooked up, you can still play the synth with your computer's QWERTY keyboard. You can even change the oscillator parameters in the instrument panel - you can adjust tuning, fine-tuning, pulse-width, and you have your choice of three waveforms. You made it - a basic, playable synth in Reaktor.

Let's see how you can build a more capable synth in just a few more minutes...

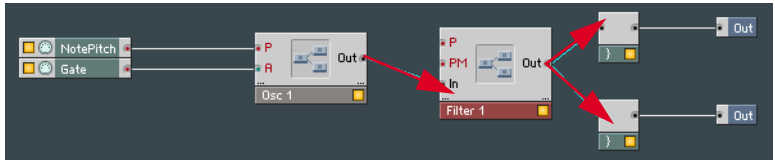
Add a lowpass Filter

Reaktor 4 comes with many filter macros and modules. Let's add a simple low-pass filter. Right click to add the Filter macro as shown:



Now connect the Filter

Simply connect the filter as shown:



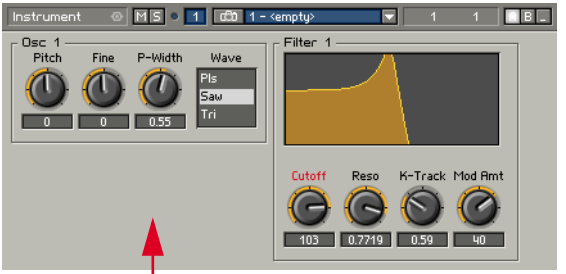
Now you can play your synth. You can adjust the filter cutoff and resonance from the panel. A graphical display of the filter response is also shown - when you tweak the resonance and cutoff knobs, notice how the graph dynamically responds.

Optimize the panel layout

After adding the filter you'll notice that your instrument panel is a bit messy. The filter and oscillator macros are overlapping - to clean things up, simply click on the small hexagon to the right of the Instrument name:

You've now just unlocked the panel, and you're free to drag the elements around as you wish. If you drag on a macro frame, then all of the elements in the macro will move together.

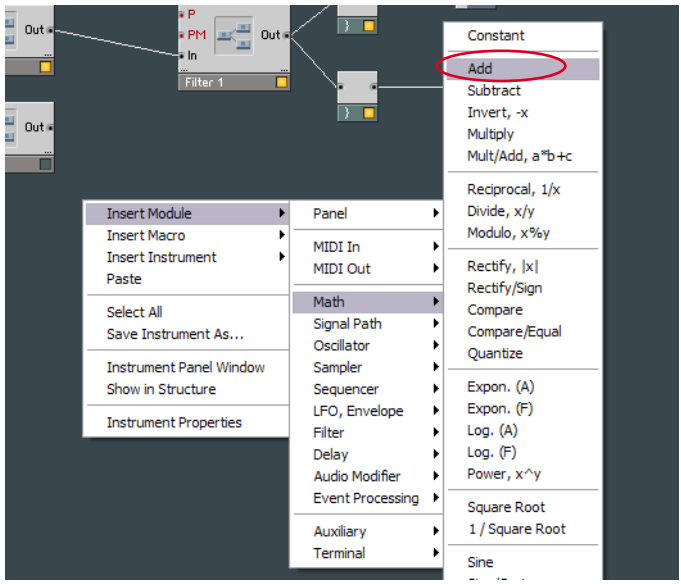
You can arrange your panel however you like. We chose an arrangement like this:



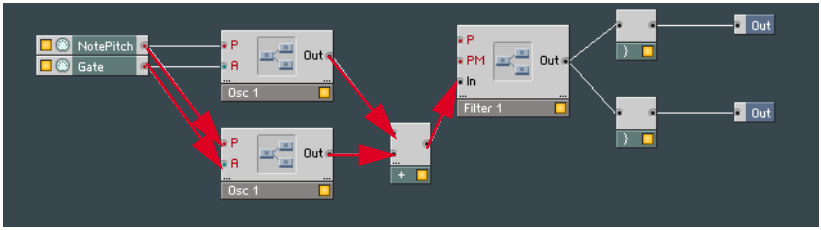
Add a second Oscillator

Notice the big empty space underneath the oscillator in the panel that's just screaming for attention. To see how easy it is to turn a single-oscillator synth into a dual-oscillator one, simply copy and paste the Oscillator macro in the structure.

We can connect both oscillators to the same filter, but first we need to insert an adder "+" module. An adder mixes (adds) two signals together. Right-click to insert an adder module like so:

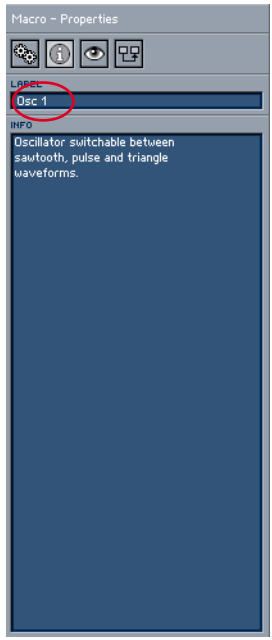


Now connect the output of each oscillator to the inputs of the adder, and the output of the adder to the input of the filter. Don't forget to connect the notepitch and gate modules to the appropriate inputs on the second oscillator, so your structure so far looks like this:



Finally, make sure that the instrument panel is unlocked (click on the hexagon to turn it into a wrench), and rearrange your panel like so:

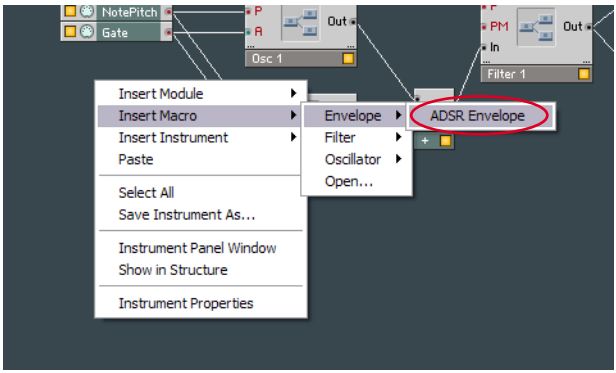
In the picture above, notice that the two oscillators have different names: the top one is “Osc 1” and the bottom one is called “Osc 2”. We can change the name of any module or macro or instrument in the **properties** panel. To get to the properties panel, just right click on the specific object (either the macro frame in the panel or the macro in the structure). Here you can change the name to whatever you want:



We could stop now if we wanted. With just a few basic modules and only two macros, we've built a functional but basic synthesizer with two oscillators and a filter. We can detune the oscillators relative to each other, select a different waveform for each oscillator, and control the filter cutoff and resonance. But let's not stop here, with just a few more steps we can create a pretty sophisticated instrument.

Add an Envelope

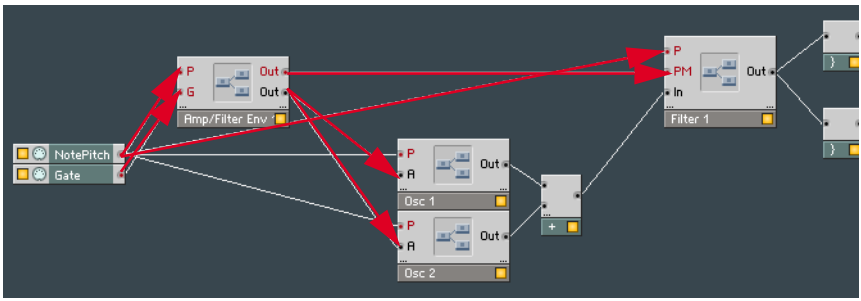
An envelope lets us specify how the sound changes over time. Add a basic ADSR (Attack - Decay - Sustain - Release) envelope like so:



Naturally, we need to connect the envelope in order to activate it. If we just wanted the envelope to control the volume of the sound, would could simply connect the MIDI gate module to the G input of the envelope macro, and the envelope Out port to the amplitudes of Osc 1 and 2. But for a more interesting sound we can also have the envelope control the filter by connecting the output of the envelope to the **PM** (pitch modulation) input in the filter.

We can also activate the keytracking parameter of the filter by connecting the notepitch to the **P** filter input.

Here are all the new connections:



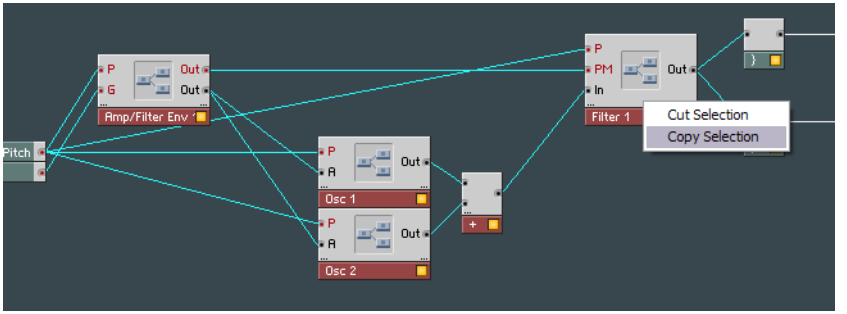
By now you've probably noticed that some in and out ports are red and others are black. What's the difference? The difference is that the black ports run at the full sampling (audio) rate. This is the rate you specified in the **Audio and MIDI Settings...** menu. The red ports run at an adjustable control rate (usually 400 messages per second). Using a control rate signal for amplitude could result in clicks, so that's why the Osc amplitude inputs run at audio rate. Simple messages, such as MIDI pitch information, work quite well at the much slower control rate.

Now that everything's connected, unlock the panel again and arrange the macros how you like:

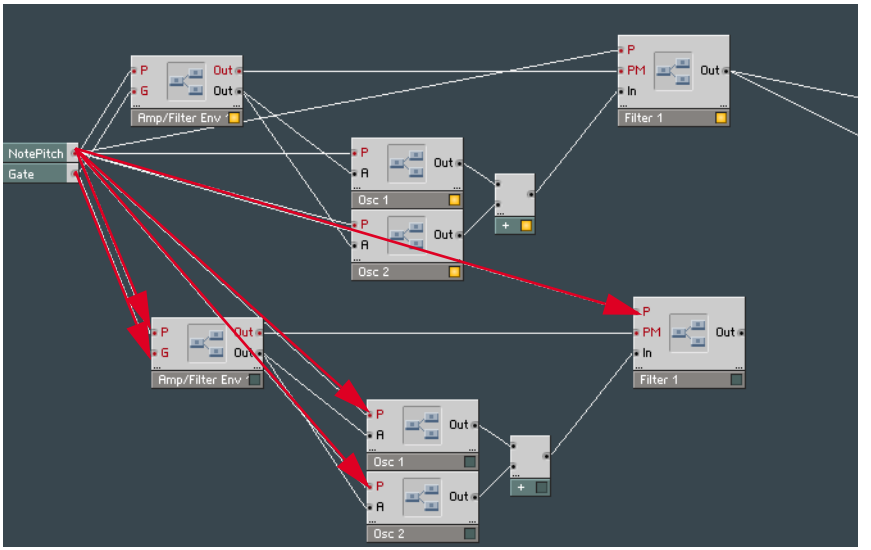
Are we done yet? Well, we could be, but let's just double everything that we have to create a four-oscillator, dual-filter, two-envelope monster.

I'll take a double!

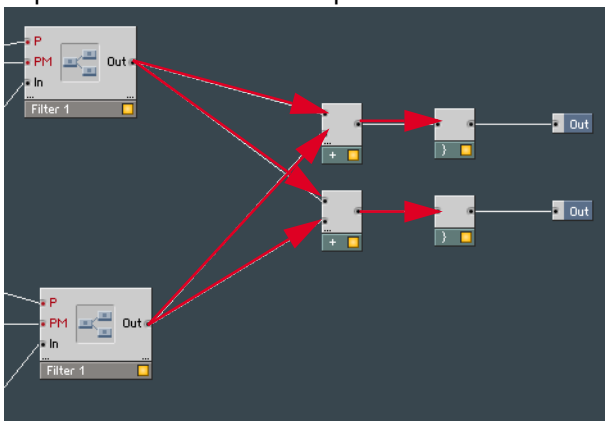
Select the following macros, then copy and paste them:



All connections between the molecules you just duplicated should remain.You have to tell Reaktor how to hook up the new modules, however.



We just have to mix the sound from the original and the duplicated macros. First insert two more adder modules (or just copy and paste the ones we already have) as shown below. Then connect the output of each filter to the input of each adder module:



Make the panel pretty

All we have to do now is clean up the panel to make a logical and sensible arrangement of the controls, like this:

Adjust the voicing

One of Reaktor's strenghts is the ease with which we can adjust how many voices an instrument has. From one to 1024, we can enter the polyphony of the instrument in the title bar of each instrument.

Notice the Unison parameter - here we can set the number of voices playing at once, each voice slightly detuned for a very fat sound. Try setting the voices to 12 and the unison to 6 for twelve total voices and six voices playing at a time. You'll be able to play two notes at once with this configuration - if you want to be able to play more notes simply set the number of voices higher.

Futher Learning

Since the demo version doesn't allow you to save your creations, we've included the completed tutorial synth for you to learn from. The finished synth is located in the Library folder.

Note that in this synth, we've added a chorus. In Reaktor, not only can you connect elementary modules and macros together, but you can also wire finished instruments to create a custom studio. Instruments are wired together in the same way that modules and macros are.

The full version of Reaktor includes around 30 ensembles, 40 instruments, and more than 250 macros. Additionally, all registered Reaktor users can upload to and download from the daily-growing user library, where there are currently around 1300 user-creted ensembles to learn from or to use in your own productions.

Reaktor Session

If you love the sound of Reaktor's instruments but would rather leave the building to someone else, then Reaktor Session might be the right Reaktor for you. Reaktor Session includes all the same ensembles as Reaktor, and access to the User Library. You cannot view, edit, or create structures, but you have unlimited use (standalone and plug-in) of all ensembles.