

**Oakley Sound Systems**

**5U Oakley Modular Series**

**Croglin**

**Dual Voltage Controlled Filter**

**Croglin PCB Issues 1, 2 & 2.1**

**User Manual**

**V2.2**

Tony Allgood  
Oakley Sound Systems  
CARLISLE  
United Kingdom



*The suggested panel layout for the single width MOTM format module.*



*The suggested panel design for the full double width MOTM format module.*

## Introduction

This is the User Manual for the Croglin Dual Voltage Controlled Filter 5U module from Oakley Sound. This document contains an overview of the operation of the unit and the calibration procedure.

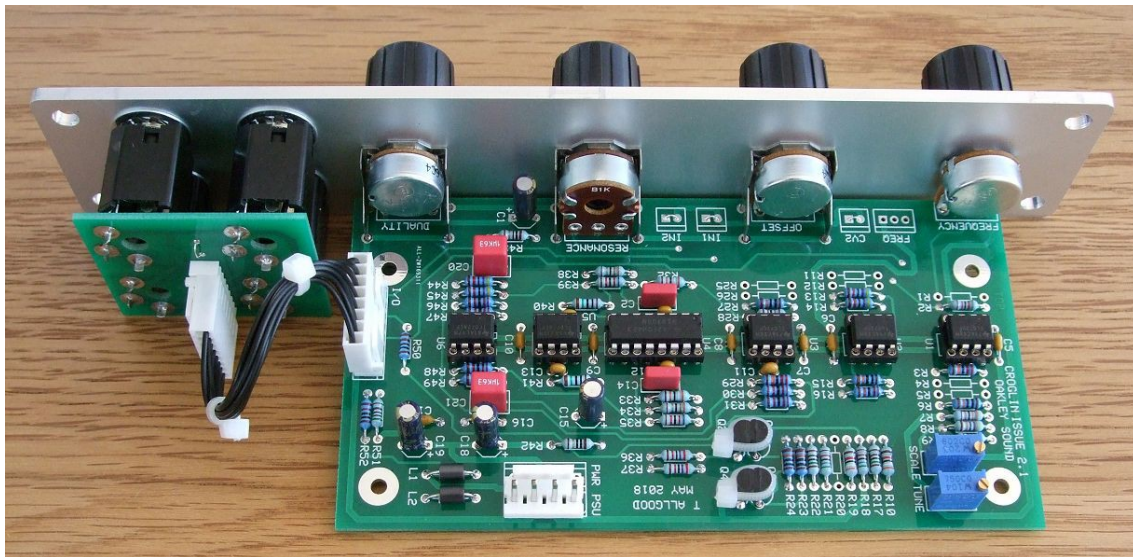
For the Builder's Guide, which contains a basic introduction to the board, a full parts list for the components needed to populate the boards, and a list of the various interconnections, please visit the main project webpage at:

<http://www.oakleysound.com/croglin.htm>

For general information regarding where to get parts and suggested part numbers please see our useful Parts Guide at the project webpage or <http://www.oakleysound.com/parts.pdf>.

For general information on how to build our modules, including circuit board population, mounting front panel components and making up board interconnects please see our generic Construction Guide at the project webpage or <http://www.oakleysound.com/construct.pdf>.

## The Oakley Croglin Dual Filter Module



*This is a issue 2.1 Oakley Croglin dual filter module behind a natural finish 1U wide Schaeffer panel.*

The Oakley Croglin Voltage Controlled Filter is based around two unusual low pass filter circuits that operate either together or against each other.

Each filter is based around a peculiar low pass filter topology first seen in a classic portable synthesiser from the late 1970s. For the Croglin VCF I have completely redesigned the circuit to produce a stable, lower noise design that unlike the original covers most of the audio band and gives the user far greater control over the parameters of the filter.

The cut off frequency of each filter can be controlled by a common control voltage and the front panel's Frequency pot. The second filter's cut off frequency can also be offset from the first. This can be done with either the Offset pot or an offset CV. The offset can be both positive, making the cut off frequency of the second filter higher than the first with a positive input CV, or negative, making the frequency lower than the first. A wide variety of tonal responses can be made; from the traditional low pass filter and band pass sounds to complex vocal like formants.

The two filters work in parallel on the audio input signal. The output of the first filter is then passed directly to the output but a proportion of the second filter may be added or subtracted from this. The level of the second filter is controlled by the Duality pot. In the middle position the Duality pot allows no audio to come from the second filter. Fully clockwise the second filter is added to the first filter's output. Fully anti-clockwise the second filter's output will subtract and cancel out those parts of it that are common with the first's output.

## The Filter Core Idea

As you have read this module can be made into either a standard 2U wide module, or as a compact 1U filter core module.

The Filter Core idea has come from the fact that many of our customers were buying different filter types, eg. they may have an MS-20 clone, a Moog ladder filter and an SVF. Each filter type gives a different sound so its worthwhile having a few in your modular set up. However, each filter module also has its own input mixer for audio and an input mixer for CVs. This adds to panel real estate and soon your modular is filling up very quickly. While this does look very impressive, it does mean that, in many patches, you have a lot of redundant electronics in your modular.

Step forward the 'filter core'. This is quite simply a 1U module that contains only the filter and a few important front panel pots. All the audio and CV mixing is done externally with a dedicated mixer module, like the Multimix. The good thing about this is that any unused filter module is only 'wasting' 1U of panel space. So you can afford to have many different flavours of filter without the additional cost and panel space of mixers.

However, as with all things, there are disadvantages too. The lack of inbuilt mixers mean that you will need to get more dedicated mixer modules. But remember that these relatively cheap mixer modules can be used for **any** mixing or level controlling within your modular. Thus, you have more flexibility, at the expense of a little more patching.

The great thing about the Oakley Filter Core modules is that they will all be designed so that they can still be used in the full format design. All the Filter Core modules will have input summing amplifiers built onto the PCB. You won't be using these circuits in the 1U format, but they are there if you want to go for the larger 2U or 3U designs.

## Trimmers

There are just two multiturn trimmers, or presets as we used to call them in the UK, on the PCB. You should use a proper trimmer tool or a fine blade jeweller's screwdriver for adjusting them. Vishay and others make trimmer adjusters for less than a pound.

**TUNE:** This adjusts the filter's cut-off frequency. Set this so that the filter's FREQUENCY pot covers your chosen range. I would normally place this in the middle position for now, that is 10 turns or so, from one of the end points.

**V/OCT:** This adjusts the scaling (or sensitivity) of the exponential inputs. It should be stated right now that you will not be able to achieve perfect keyboard tracking from the Croglin Dual Filter.

If you have the 1U 'Filter Core' version of this module there is no need to adjust the V/OCT trimmer. Simply leave it in its middle position. You will be controlling all CV depths with your connected external mixer module.

For the full 3U module you have a dedicated KEY CV socket. In a perfect world V/OCT should be adjusted so that there is an octave jump in cut-off frequency when the 1V/OCT input is raised by one volt. However, since the Croglin does not self-oscillate it is going to be tricky to set this accurately. Indeed, one could argue whether there is any need to do it at all.

But if you do want to have a go then you will need some way of monitoring the resonant frequency. I used the spectrum analyser plug-in in Ableton Live, but any decent spectrum analyser will work.

Turn the resonance pot fully up and connect up a 110Hz sawtooth signal to the module's audio input, IN3. Plug the output of the filter into your computer's soundcard input and monitor the output signal on the spectrum analyser. Then connect the KEY CV socket to the 'keyboard CV' out of your midi-CV convertor or analogue keyboard. Make sure what you are playing does not affect the VCO's pitch, you are only after changing the cut-off frequency of the Croglin module.

Play an A on your keyboard and adjust the FREQUENCY pot so that the filter accentuates the sawtooth's harmonic around around 880Hz. You have now set the filter's resonant frequency to around 880Hz. Now play the A note one octave higher than you were pressing. By adjusting TUNE and V/OCT you should aim to get the higher A to make the module accentuate the 1760Hz harmonic, ie. double 880Hz. However, any change in V/OCT will also change the lower resonant frequency as well as the higher note. So you will have to move back and forth between altering TUNE and V/OCT until you get the octave spread you require. Remember though that the Croglin will not be able to track perfectly over a wide range. However, since the action of the Croglin module is to filter, this lack of perfect scaling should not be a problem.

## Final Comments

I hope you enjoy using the Oakley Croglin module.

If you have any problems with the module, an excellent source of support is the Oakley Sound Forum at [Muffwiggler.com](http://Muffwiggler.com). Paul Darlow and I are on this group, as well as many other users and builders of Oakley modules.

If you have a comment about this user manual, or have found a mistake in it, then please do let me know.

Last but not least, can I say a big thank you to all of you who helped and inspired me. Thanks especially to all those nice people on the Synth-DIY and Analogue Heaven mailing lists and those at [Muffwiggler.com](http://Muffwiggler.com).

***Tony Allgood at Oakley Sound***

Cumbria, UK

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