Oakley Sound Systems

5U Oakley Modular Series

Fourmix
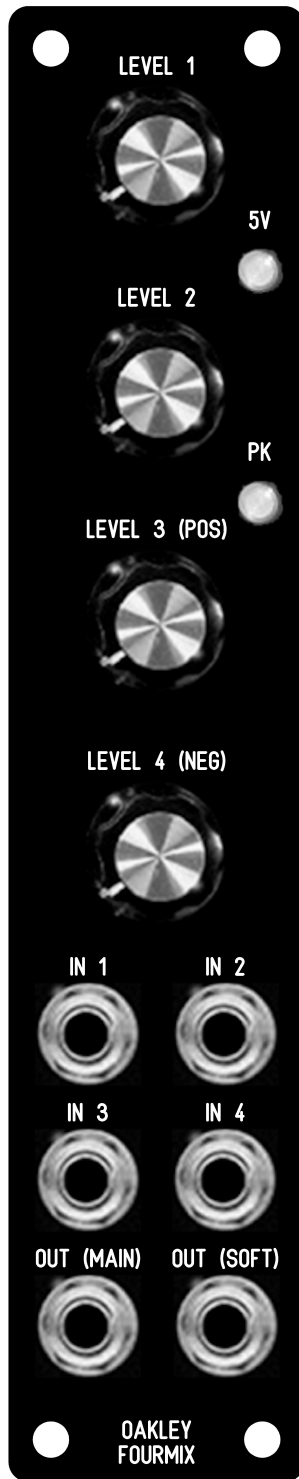# CV and Audio Mixer

Fourmix PCB Issue 1 & 2

User Manual

V1.2

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LEVEL 1

5V

LEVEL 2

PK

LEVEL 3 (POS)

LEVEL 4 (NEG)

IN 1   IN 2

IN 3   IN 4

OUT (MAIN)   OUT (SOFT)

OAKLEY
FOURMIX

The suggested panel design for the MOTM format version of the Oakley Fourmix.

Introduction

This is the User Manual for the issue 1 and issue 2 Fourmix 5U module from Oakley Sound. This document contains only an overview of the operation of the unit.

For the Builder's Guide, which contains a basic introduction to the module, 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/fourmix.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 Fourmix Module
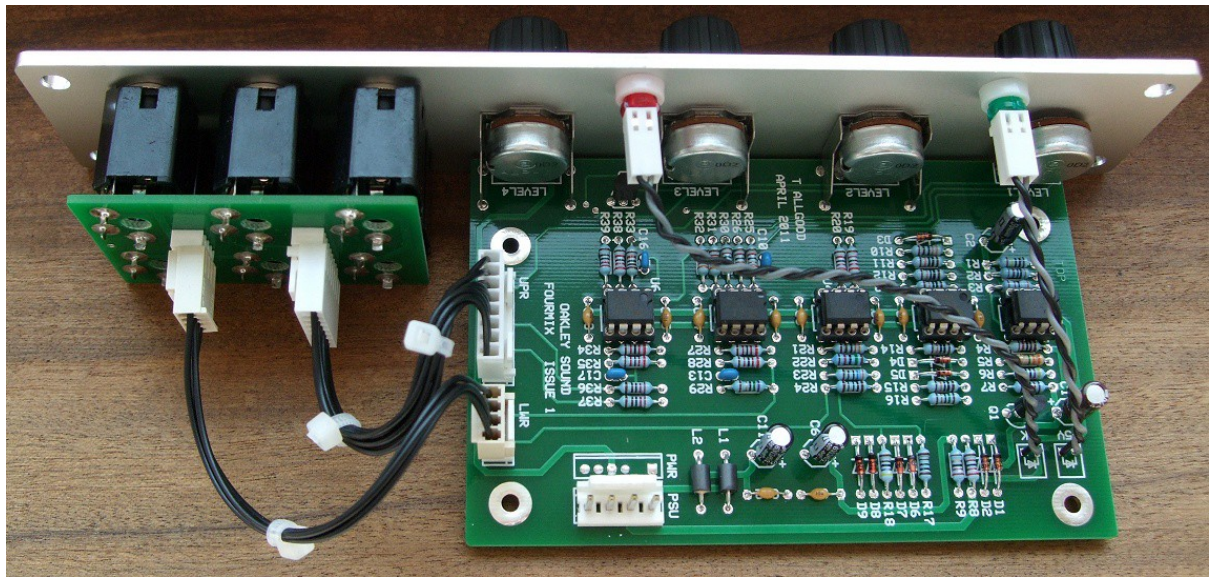
The prototype issue1 Fourmix module behind a natural finish 1U wide Schaeffer panel. Issue 2 boards are similar.

Our simple but useful four channel mixer for use with control voltages and audio. Each channel has an independent level control that goes from fully off to unity gain (0dB).

Two outputs are provided. OUT (MAIN) is a low impedance driver that simply presents the sum of the input signals as controlled by the level pots. The other, OUT (SOFT), is also the sum of the inputs but this time the signal is passed through a special 'soft clipping' circuit. This soft clipper is designed to sound like an overdriven valve amplifier and adds a form of harmonic distortion that is musically interesting.

If no jack plug is inserted into the IN 3 socket then by adjusting the LEVEL 3 pot you will add a positive offset voltage to the output. Likewise, if no jack plug is inserted into IN 4 then the LEVEL 4 pot will control the amount of negative offset that is added to the output. Each pot therefore can either act as a constant voltage source which can be added to other CVs for controlling other modules. Furthermore, it can also be used to generate asymmetrical signal clipping in either any following modules or by using the soft output of the Fourmix itself.

The module also features two output level LEDs. These monitor the signal level at the main out socket. The 5V LED lights when the signal exceeds +/-5V and indicates that soft clipping is about to take place from the soft output. The peak LED lights when the output signal is getting near hard clipping, ie. around +/-11V. Special circuitry is employed to ensure the LEDs do not cause power supply clicks when they turn on or off.

To allow all the functions required by this module we have had to reduce the spacing between the pots. Instead of our usual 1.625" (41.3mm) we have opted for the smaller 1.375" (34.9mm). Used in conjunction with the smaller 20mm (13/16") diameter knobs this still allows for an attractive module design and finger friendly tweaking.

The OUT (MAIN) output

This produces a signal that is equivalent to the sum of the four inputs as controlled by the four level control pots. As with all mixer circuits it is possible to exceed the maximum allowed output voltage if the input signals and input levels are set too high. For example using three input signals of 6V peak with their pots set to full should produce a theoretical 18V peak signal. This is beyond the capabilities of the Fourmix since the power supply to the module is only +/-15V and the circuitry can produce at best a +/-13V signal from the output. This discrepancy causes what is called 'clipping'. It is called this because the output waveform is essentially clipped off at the top and bottom where it wants to go but cannot. This hard clipping tends to sound harsh and overly bright. It can be musically interesting though and doesn't actually cause any harm to the module.

The two LEDs on the front panel help you avoid hard clipping. If the red peak LED is coming on often then it is more than likely that you are hard clipping the MAIN (OUT) signal. If you want to avoid such clipping you should be looking at never allowing the peak LED to light up at all. The green LED indicates a signal above +/-5V and this is the normal signal level expected within a modular synthesiser. Typically, the input pots should be adjusted so that the green LED should be coming on occasionally.

The OUT (MAIN) output signal is buffered. That is it will not droop significantly with increased load. In other words, unlike the normal outputs of audio modules, the output level will not change no matter how many modules (within reason) you connect up to it. Thus it is useful for distributing sensitive control voltages to multiples of modules. It should be noted that any Oakley modules that process KeyCV (the main pitch controlling control voltage in the modular) will also feature the same buffered output circuitry as the Fourmix.

The main output of the Fourmix can be used as a precision voltage source. Channel 3 and Channel 4 produce positive and negative reference voltages respectively when no jack plug is inserted into their input socket. With their level pots set to their maximum the voltage is just under +4.5V for channel 3 only and just under -4.5V for channel 4 only. Since each channel is of opposing polarity using both channels simultaneously will produce a cancellation effect. That is, if both 3 and 4 are set to their maximum settings the final output voltage will completely cancel and produce zero volts from the output.

The OUT (SOFT) output

With signal levels under 3.5V or so the soft output produces pretty much the same signal as the main output. However, as the signal level rises on the main output, the signal seen at the soft output becomes more and more distorted. It is effectively being gently compressed at the top and bottom of the waveform. This is clipping of a kind since it does restrict the maximum output voltage but because it comes in gracefully it is called soft clipping.

One can think of soft clipping as being much like ordinary audio compression but acting so fast it it operates on each cycle of the audio waveform. The maximum signal level likely to be seen at the soft output is not much above 6V peak.

The soft clipping output is useful to limit a CV or audio signal in a musically interesting way. For audio it tends to bring out the fundamental tone of the signal in a subtle way. Do not expect screaming Marshall lead tones – this is a mild effect and one that is akin to overdriving a discrete VCA or fully open Moog ladder filter.

You can use the soft output as reasonable triangle wave to sine wave convertor. If you do this you can also create asymmetrical distortion by using the voltage sources built into channels 3 and 4 on the Fourmix.

The output is not buffered and has an output impedance of 1K.

Final Comments

I hope you enjoy using the Oakley Fourmix module.

If you have any problems with the module, an excellent source of support is the Oakley Sound Forum at Muffwiggler.com. I am 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 a 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.

Tony Allgood at Oakley Sound

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