

**Oakley Sound Systems**

**5U Oakley Modular Series**

**Equinoxe**

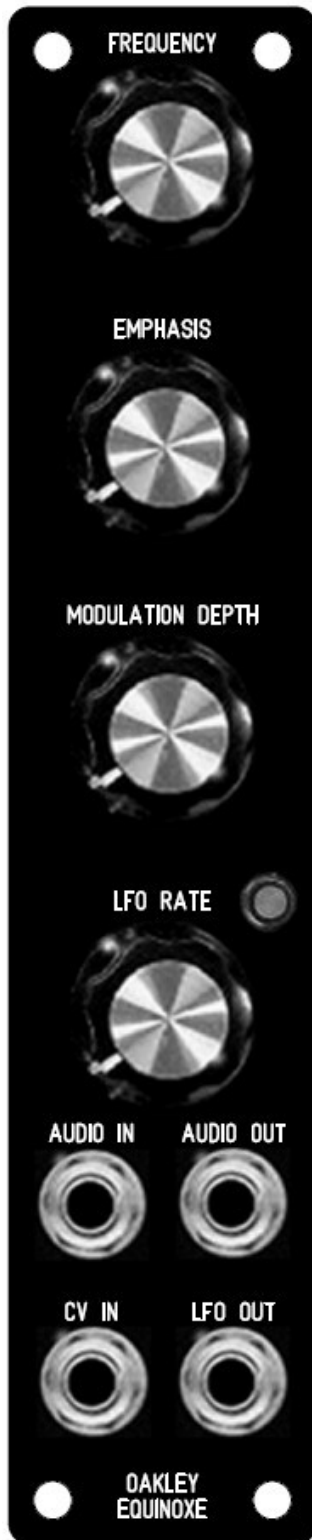
**Voltage Controlled Phaser**

**PCB Issue 5**

**User Manual**

**V5.3**

Tony Allgood  
Oakley Sound Systems  
CARLISLE  
United Kingdom



*The standard front panel design for the 1U wide MOTM format module.*

## Introduction

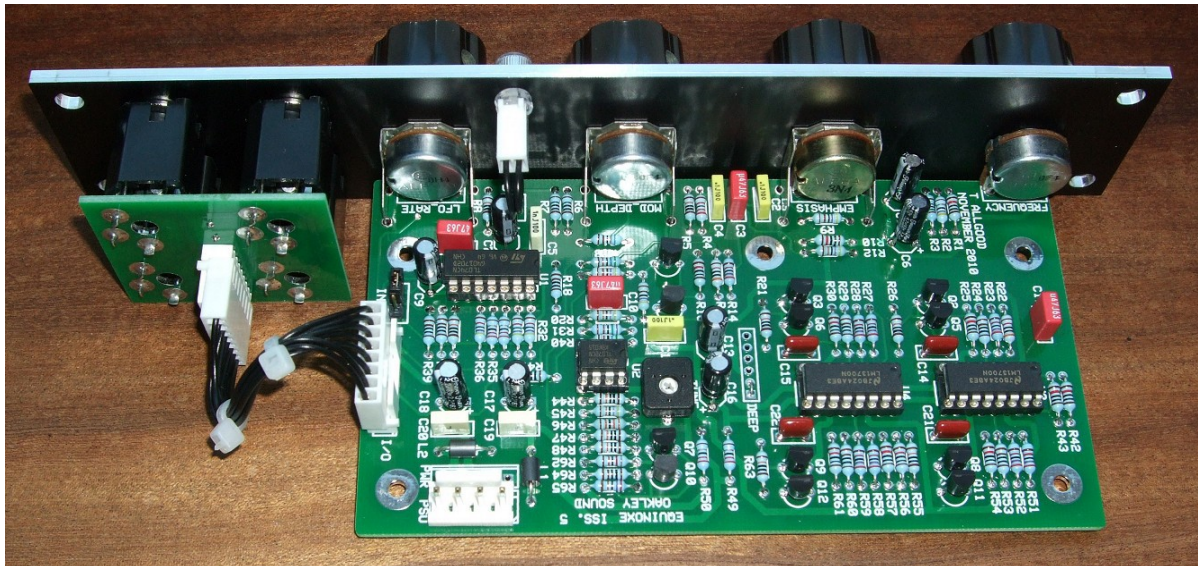
This is the User Manual for the issue 5 Equinoxe 5U module from Oakley Sound. This document contains an overview of the operation of the unit and all the calibration procedures.

For the Builder's Guide which contains information on how to construct the module from our PCB and parts kits please visit the main project webpage at:

<http://www.oakleysound.com/equinox.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 standard Equinoxe module fitted into a black finish Schaeffer panel.*

## The Issue 5 Oakley Equinoxe Voltage Controller Phaser

The Oakley Equinoxe is a classic four stage OTA based phaser and designed to be similar in sound to the phaser used by Jean Michel Jarre on the Oxygene and Equinoxe albums.

In its standard form the Oakley Equinoxe produces two deep notches in the frequency response of the unit. These notches can be considered as band stop filters whereby a very narrow portion of the sound's spectrum is filtered out. Since the standard Equinoxe has four internal phase shifting stages two notches are produced.

The Equinoxe allows the frequency of all the phase shifting circuits to be controlled by an external control voltage (CV). This allows envelope generators to be used to sweep the phaser to create filter type effects. It also contains an inbuilt low frequency oscillator that is connected internally to the phase shifter when a CV is not being applied.

The module has four pots:

- Frequency:** This controls the frequency of the two notches created by the phase shift network.
- Emphasis:** This accentuates the feedback signal within the phaser to create a deeper effect.
- Modulation depth:** A simple attenuator to adjust the level of the internal LFO or incoming CV. With no jack plug inserted into the CV IN socket the internal LFO is controlled by this pot. When a jack plug is inserted into CV IN then the LFO is automatically disconnected and the CV input takes over.
- LFO rate:** Adjusts the speed of the LFO. A dual colour LED indicates the output status.

The internal LFO produces a triangle wave output which is also available from a front panel socket. This allows you to use the internal LFO for other modulation purposes. As stated above the LFO signal is automatically routed to the modulation depth pot when no jack is inserted in the CV input.

The LFO output can be configured as normal or inverted. In normal mode the LFO output is simply a copy of the signal being sent to the phaser circuitry. That is the voltage output from the LFO OUT socket rises as the phaser frequency moves upwards. In inverted mode the LFO output is an inverted signal. Thus when the phaser is being swept upwards, the LFO OUT signal is going downwards. The mode is selected by the position of a movable jumper found at the lower edge of the circuit board. It is not expected that you will be changing the mode on the fly. The LFO mode does not affect the polarity of any CV IN signal.

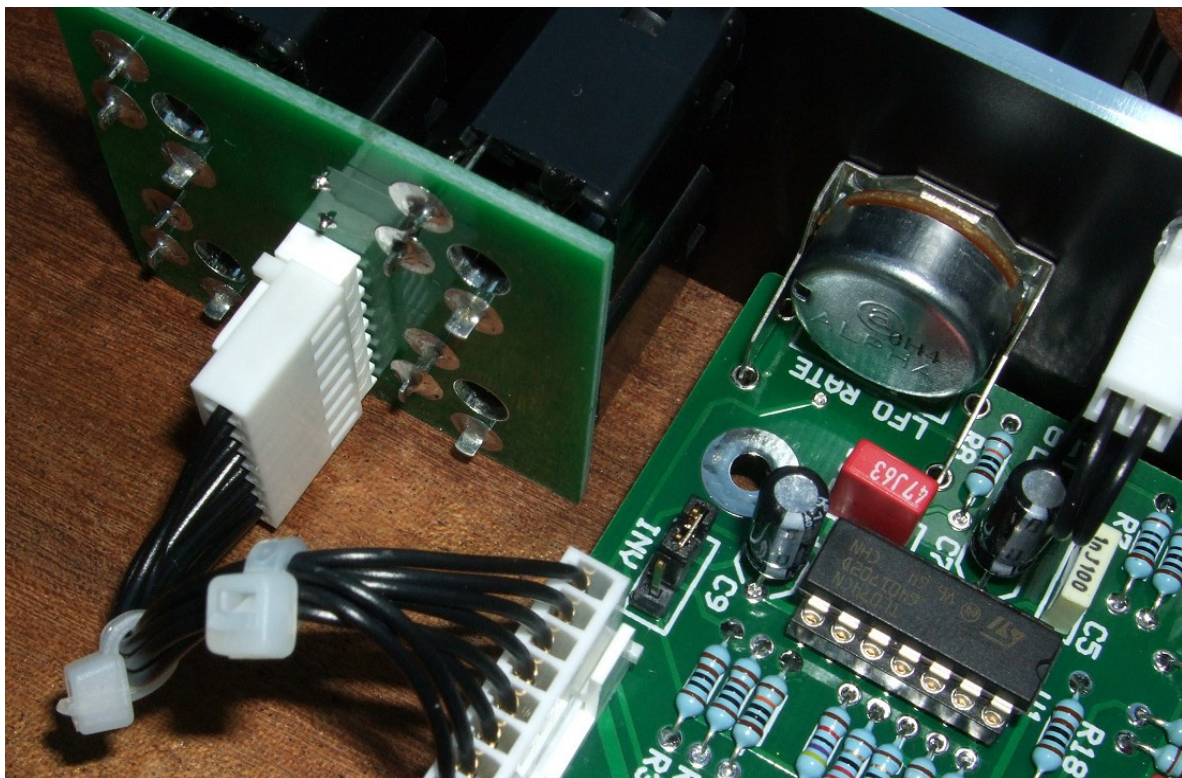
By having two Equinoxe modules you can use one to modulate the other. Simply connect the LFO OUT of one (the master) to the CV IN of the other (the slave). You can now modulate both phasers with the master's LFO. If the LFO mode is set to non inverting this will allow for true stereo phasing, whereby both channels are treated equally. With mode set to invert then

you will create a form of stereo phase panning, where each phaser moves in an opposite direction to give a wide stereo effect.

The unit is designed to work with standard MOTM/Oakley signal levels, although it is possible to modify your unit to be run straight from a guitar.

Power (+/-15V) is provided to the board either by our standard Oakley 4-way header or Synthesizers.com header. Current draw is around 30mA. This unit will also run from a +/-12V supply with a slight reduction in dynamic range.

The Oakley Equinoxe is also available in a small modular format as the Analogue Systems RS400.



*Here we can see the three pin header and two way jumper that selects the LFO mode. In the position shown in the photograph the LFO OUT will produce an inverted signal - the jumper is aligned with the letters INV on the circuit board.*

## Issue History

Issue 1 was the first version and is easily identifiable by its use of the green plastic Omeg E16 pots. During 2003 it was reported that some Omeg pots were failing in the field and, indeed, some had even been supplied to us from the factory as faulty. During that year we completely revamped the whole Oakley modular range to use a more reliable and expensive part.

The new issue 2 PCBs were made to support Spectrol/Vishay 248 pots and used our specially made and somewhat expensive Oakley 'Spectrol' pot brackets.

The new issue 2 also corrected the small fault in PCB legending which showed Q2 the wrong way around. It also incorporated two 'PAN' pads to allow for easier wiring to the sockets. The LFO and LFO-NC outputs which had to share a pad on the old issue board now have their own buffered and isolated output signals. Any loading on the LFO output would not now affect the depth of modulation to the Equinoxe phaser.

The LED driver was made more complex. The issue 1 design simply relied on a resistor to control the current through the LED. When the LFO output was very low the LED would blank out completely. The issue 2 design controlled the LED through a constant current source. Therefore, although the LED will still vary in intensity and colour with the triangle waveform output, it never actually goes out. This gives a more useful and pleasant display.

With issue 3, released in 2006, the circuit board was now fully RoHS compliant and was made using a lead free process. The OTA devices were now two LM13700 instead of four CA3080. The CA3080 was made obsolete by Intersil, formally Harris and RCA, and in any case was not available in an RoHS form. Even with this profound change in devices there are no discernible differences in sound between the issue 2 and issue 3 designs of the Equinoxe.

Also included with issue 3 PCBs was the ability to make the LFO output inverted or non inverted. However, this was done by fitting certain components and therefore had to be done at the construction stage. The TUNE trimmer was given a bigger usable range and was made easier to set.

Issue 4 boards were released in 2009. These were identical to issue 3 but for the addition of Synthesizers.com power headers.

In late 2009 it was decided to move over to another type of pot. Vishay had pushed the prices of their old Spectrol range up to such a degree it was not economic to continue to use them. The BI 260P pot was a useful alternative but stocks were hard to find and the log taper pots had a poor performance. Issue 5 boards use the Alpha 16mm pots, which are good quality clones of the standard ALPS 16mm pot.

Issue 5 also incorporates a jumper to select between LFO modes and features a six way header for expansion to the Deep Equinoxe daughter board.

## Calibration

There is only one trimmer to set up and it's pretty easy to do. Set the 'frequency' and 'emphasis' pots to their maximum value and the 'mod depth' and 'LFO rate' to the minimum values. Now turn the trimmer to its fully clockwise position. Power the unit up and input a sawtooth waveform into the input. Any frequency will do, but a low to medium note is best. Listen to the output through your normal listening set up.

Now slowly turn the trimmer in anti-clockwise direction. The moment the sound alters in texture stop turning. You may have to go back a little bit and do it again until you get it right. It'll probably end up being somewhere around its half way point. What you are doing is setting the top frequency of the FREQUENCY pot. It's not terribly important that you set this accurately, so don't worry about it if you don't get it absolutely right.

## Final Comments

I hope you enjoy using the Oakley Equinoxe phaser 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, Oakley-Synths and Analogue Heaven mailing lists and those at [Muffwiggler.com](http://Muffwiggler.com).

***Tony Allgood at Oakley Sound***

Cumbria, UK  
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