METASONIX

R-54 *Supermodule* VCO/filter user's manual

READ THIS, DAMMIT!!!!!!!!!

RETAIN INSTRUCTIONS: The safety and operating instructions should be retained for future reference.
HEED WARNINGS: All warnings on the R-54 and in the operating instructions should be adhered to.
FOLLOW INSTRUCTIONS: All operating instructions should be followed.

WATER AND MOISTURE: The R-54 should not be used near water (e.g. near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, near a swimming pool etc.). Care should be taken so that liquids are not spilled onto or near the enclosure.

VENTILATION AND COOLING: The R-54 normally operates warm to the touch. It MUST be situated so that its location or position does not interfere with convective cooling. The R-54 MUST NOT be used on a bed, sofa rug or similar surface which may prevent proper cooling. It is NOT a toy. If the R-54 is mounted in a synthesizer rack or other built-in installation, space *must* be left around it to allow convection cooling.

HEAT: The R-54 MUST be situated away from heat sources such as radiators, heat registers, stoves, or other devices (including power amps) that produce heat.

POWER SOURCE: The R-54 should be connected to a power supply ONLY of the type described in the operating manual or as marked on the R-54. It uses +12v and -12v at 150 mA, and draws about 400 mA when first powered on (dropping to ~150 mA after a few seconds). The power input is a standard Doepfer (tm) 16-pin IDC type, with the -12v pins on the BOTTOM (same orientation as on Doepfer power bus boards). The pins above the +12v pin row are not used and not connected.

CLEANING: The R-54 should only be cleaned with a soft cloth moistened with water. Unplug the power supply before attempting to clean.
NON-USE PERIODS: The R-54 should be shut off when left unused for a long period of time.

DAMAGE OR TUBE REPLACEMENT REQUIRING SERVICE:
The R-54 should be serviced by qualified service personnel when:
--The power supply has been damaged;
--The R-54 has been dropped, physically damaged, or subjected to force;
--Liquid has been spilled onto the R-54 or it has been exposed to rain;
--The R-54 does not appear to operate normally or exhibits a marked change in performance.
SERVICING: The user should not attempt to service the R-54. All servicing should be referred to qualified service personnel.

METASONIX LIMITED WARRANTY and standard legal disclaimer

Thank you for purchasing this Metasonix product. The following terms and conditions apply:

1. Warranty period is for ONE YEAR from date of purchase with proof of purchase submitted. Warranty covers electrical failure of vacuum tubes and gas-filled tubes, except in cases explained in 3 below.

2. Operating instructions must be followed. This device was intended ONLY for use by AUDIO AND MUSIC PROFESSIONALS.
IT IS NOT INTENDED FOR USE BY ORDINARY CONSUMERS!!
Product must not have been damaged as a result of defacement, misuse, abuse, neglect, accident, destruction or alteration of the serial number, improper electrical voltages or currents, repair, alteration or maintenance by any person or party other than our own service facility or an authorized service center, use or installation of non-Metasonix replacement parts in the product, or the use of this product outside of the U.S.A. or Canada (except as a product distributed by an authorized Metasonix dealer), or modification of the product in any way, or incorporation of the product into any other products, or damage to the product caused by accident, fire, floods, lightning, or acts of God, or any use violative of instructions furnished by Metasonix.

3. Obligations of Metasonix shall be limited to repair or replacement with same or similar unit, at our option. To obtain repairs under this warranty, present the product and proof of purchase (e.g. bill or invoice) to the authorized Metasonix service center, transportation charges prepaid. When returning the product for repair, please pack it very carefully, preferably using the original packaging materials. Please also include an explanatory note.

IMPORTANT:

To save yourself unnecessary cost and inconvenience, please check carefully that you have fully read and followed the instructions in this instruction manual.
This warranty is in lieu of all other expressed warranties, obligations or liabilities. ANY IMPLIED WARRANTIES, OBLIGATIONS, OR LIABILITIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL BE LIMITED IN DURATION TO THE DURATION OF THIS WRITTEN LIMITED WARRANTY. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. IN NO EVENT SHALL WE BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF THIS OR ANY OTHER WARRANTY EXPRESS OR IMPLIED, WHATSOEVER. Some states do not allow the exclusion or limitation of special, incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

METASONIX shall not be held liable for any incidental, consequential, or direct damages or expenses associated with the use or misuse of its products. The audio output of this product is capable of damaging some types of solid-state audio equipment; such use is entirely at the risk of the user. METASONIX does not guarantee that any of its products are designed for any particular use or purpose. The entire risk of suitability and performance of this product lies with the user. Products manufactured and/or sold by METASONIX are not authorized for use as critical components in devices used in life support and other systems whose failure or performance could result in compromised safety or danger to life or property.
NOTE: All sales are FINAL, especially custom designs. Only a Metasonix authorized dealer is permitted to return products to Metasonix for a refund or exchange.

What it does:
The R-54 is a Eurorack module unlike any other. It is a new design, based on a "tunable amplifier" circuit found originally in a 1964 textbook. Essentially, it is a Wien-bridge bandpass filter which can also be used as an oscillator. Tuning is effected by a dual-element Vactrol optocoupler.

MASTER TUNING tunes the circuit through its full sweep range, from below 20 Hz to more than 5 kHz, manually. WAVESHAPE/FILTER RESONANCE controls the resonance when used as a filter, and sets/adjusts the waveform in VCO mode. Adjust WAVESHAPE/FILTER RESONANCE to the dot on the panel for a reasonably-low-distortion sinewave output. Note that these controls have very large control ranges, and their effective range is much smaller than their full rotation. This is *normal*, it was done to allow for variance of the vacuum tubes and other components.

VCO use is possible ONLY with no audio input applied to the AUDIO INPUT jack. To use the R-54 as a straight VCO, do not plug a cable into the AUDIO INPUT.

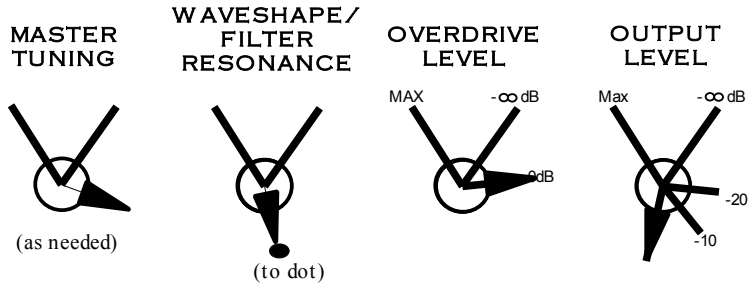
By applying an audio signal to the AUDIO INPUT, the R-54 transforms from a VCO into a 2-pole resonant bandpass filter, sweepable over the same range (about 20 Hz to 5 kHz). RESONANCE may be adjusted as needed for a low-Q bandpass response, a very sharp peak bandpass, or oscillation (which can give some unique sound effects and distortions).

The PITCH CV INPUTS control the module's frequency with a control range of approximately 0-4 volts, with the TUNING OFFSET control offsetting in parallel. Thus, the CV input will accept a broad range of effective CV changes. The full sweep range is about 8 octaves, and the PITCH CV INPUT does not track conventional solid-state VCO or filter responses (it is approximately linear or Hz/v, and V/oct CV will not give accurate pitch tracking). Tuning is accomplished with a “Vactrol” voltage-variable resistor, and will have the slow response time and odd behaviour typical of Vactrols.

The audio input is line level *only*, 10k ohms impedance, and all CV inputs have 1 megohm impedance. The audio output is able to drive a 600-ohm load. The audio input can accept any signal and cannot be damaged by overvoltage. The CV inputs are limited to +-10v range.

USAGE

For typical use as a sine-wave VCO, adjust the R-54 controls approximately as shown:



Note that the R-54 controls have considerable "extra range" beyond what they absolutely need. This is made necessary by variations in tube samples and to allow for tube aging. Do not assume these settings are written in stone, and if a different setting gives optimum results for your R-54, this is normal. Because the R-54 is totally different from any other synthesizer module you have ever used, you may be surprised by some of its quirks.

The dot next to the WAVESHAPE knob indicates where the best setting is for low-distortion sine wave production. By turning WAVESHAPE further to the right (counterclockwise), the VCO waveform can be made distorted in a manner unique to this circuit. And by turning OVERDRIVE LEVEL to the left (clockwise), a different type of clipping distortion may be produced. Varying these controls together can give a broad range of distortions. (Note that these controls interact with the VCO pitch slightly. This is normal.)

Now set WAVESHAPE/FILTER RESONANCE to the 6-o'clock position (straight down), and OVERDRIVE LEVEL back to 0dB. Inject a line-level audio signal into the AUDIO INPUT. Instantly, the R-54 changes into a bandpass filter. MASTER TUNING may be moved manually to cause the filter to sweep. Turning RESONANCE more clockwise will cause the filter to enter oscillation (WARNING: watch your monitor levels when doing this, as the sudden oscillation may be considerably louder than the signal). Turning OVERDRIVE LEVEL up can produce post-filter clipping distortion, useful for some sound effects.

MAINTENANCE

Powering the R-54 requires a power supply producing 12 volts DC ONLY, at 150 milliamps (when first powered on, the R-54 briefly draws greater current, so be aware of this when using a power supply to run it plus other modules.) You MUST assure the power supply is able to handle the R-54 load plus the load of other modules. Doepfer's A-100PSU2 is adequate to run up to 6 Metasonix R-modules with no other loads.

The tubes in the R-54 are being run VERY conservatively. They should last for tens of thousands of hours of normal use. Still, the R-54 produces a lot of waste heat, *so we recommend shutting it off when not in use.*

UNLESS YOU KNOW EXACTLY WHAT YOU ARE DOING, DO NOT REPLACE OR SUBSTITUTE THE TUBES YOURSELF!

Please note: not all tubes have easily visible heaters. If you can't see a heater glowing, DO NOT assume that tube is bad. We get many foolish complaints of this type!

TUBE REPLACEMENT: despite their expected long lifetime, the tubes might be damaged or develop faulty internal wiring connections, requiring replacement. This particular R-54 was shipped, and wired

for, one 19KG8 triode-pentode and one 6AK5 pentode. Those types are MANDATORY for use in the R-54, as no other types will have the proper pin connections and heater power requirements. Do NOT attempt to substitute other tubes. These types are quite easy to find and are available from distributors such as Radio Electric Supply (vacuumtubes.net) or Antique Electronic Supply (tubesandmore.com). (No, an 18GV8 will NOT work in place of the 19KG8.)

Note: this is an ADVANCED MODIFICATION and is NOT RECOMMENDED for inexperienced personnel.
All R-series modules can be modified to accept +-15v power supply rails and MOTM-standard power connectors. The user is responsible for fabricating a suitable front panel and adding controls and jacks as needed for a given modular-synth form factor. Addition of two 20-ohm 2W dropping resistors and a 4-pin connector is involved. Contact us for more information on this modification.

If you are confused or have ANY technical questions, feel free to contact us. Please DO NOT ASSUME and *if you are not an experienced technician,* DO NOT TRY RANDOM TUBES OR MODIFY THE CIRCUIT IN ANY WAY!

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