

T1 synthesizer

owner's manual ver. 1.0
copyright 2021-2025 METASONIX, all rights reserved

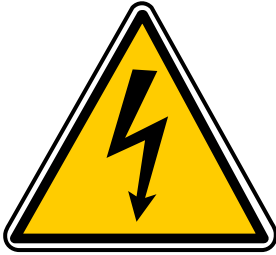


METASONIX

READ THE WHOLE THING, DAMMIT!!!!

CAUTION: to reduce the risk of electrical shock, do not disassemble.

DANGER! DANGER! HIGH VOLTAGE INSIDE. No user serviceable parts inside. Refer servicing to qualified service personnel.



DETAILED SAFETY INSTRUCTIONS: All the safety and operation instructions must be read before the T1 is operated. *If you don't read and HEED them, you are a MORON and you deserve to be EATEN BY YOUR MOTHER'S PENIS.*

RETAIN INSTRUCTIONS: The safety and operating instructions should be retained for future reference.

HEED WARNINGS: All warnings on the T1 and in the operating instructions should be adhered to.

FOLLOW INSTRUCTIONS: All operating instructions should be followed.

WATER AND MOISTURE: The T1 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., ya stupid bastard). Care should be taken so that liquids are not spilled onto or near the enclosure.

VENTILATION AND COOLING: The T1 normally operates VERY warm to the touch. It MUST be situated so that its location or position does not interfere with convective cooling.

The T1 MUST NOT be used on a bed, sofa rug or similar surface which may prevent proper cooling. It is NOT a toy, AND IT IS NOT A BIEBER-VAGINA. If the T1 is mounted in a rack or other built-in installation, space must be left around it to allow convection from the case. WE DO NOT recommend remounting the T1 electronics in another enclosure.

HEAT: The T1's tubes get HOT. It MUST be situated away from heat sources such as radiators, heat registers, stoves, or other devices (including power amps) that produce heat. We DO NOT recommend leaving the T1 powered up with the cabinet lid closed.

POWER SOURCE: The T1 should be connected to an AC-AC adapter power supply ONLY of the type marked on the T1 panel. DO NOT try to feed it with DC power. AC ONLY!!

POWER CORD PROTECTION: Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Don't burn your house down, Herzog fanboy.

CLEANING: The T1 should only be cleaned with a soft cloth moistened with water. Unplug the power supply before attempting to clean.

NON-USE PERIODS: The power inlet of the T1 should be unplugged from the outlet when left unused for a long period of time.

DAMAGE OR TUBE REPLACEMENT REQUIRING SERVICE:

The T1 should be serviced by qualified service personnel when:

- The T1 has been dropped, physically damaged, or subjected to force;
- Liquid has been spilled onto the T1 or it has been exposed to rain;
- The T1 does not appear to operate normally or exhibits a marked change in performance.

I think psychology and self-reflection is one of the major catastrophes of the twentieth century. – Werner Herzog

SERVICING: The user should NOT attempt to service the T1. All servicing should be referred to qualified service personnel.

METASONIX LIMITED WARRANTY and standard legal disclaimer

Thank you (whatever, meh) 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, 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. It is also not intended for application to the genitals.

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 the T1. The audio output of the T1 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. Don't perform surgery with a T1. It has no healing magic, and might injure your mother's gonads.

Did we mention the DANGEROUS HIGH VOLTAGES inside the T1?

DO NOT OPEN THE T1 unless you're a service technician.

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 T1 is our FLAGSHIP instrument! Our best/worst! It is an intentionally primitive device, using late 1950s technology for the entire signal path. Do not expect it to sound or behave like a Moooooog! Do not expect it to sound or behave like a copycat machine trying to sound like a Moooooooooooooooooog! Do not furiously twist the knobs in search of the 1980s DX7 tone. Fuck you and fuck the 1980s! Oh, and PS: *there are no presets!*

So, let's put it in terms even a *musician* might possibly absorb.

Think of the T1 as a primitive box containing 3 screaming children, being punched in the face to the rhythm of the internal sequencer or user supplied (this means you!) control-voltage source. These screaming voices are generated by the thyatron VCOs that are staring at you right now (you do like to read the manual while you have the unit in front of you, right?) The VCOs are modified RK7 modules, okay?

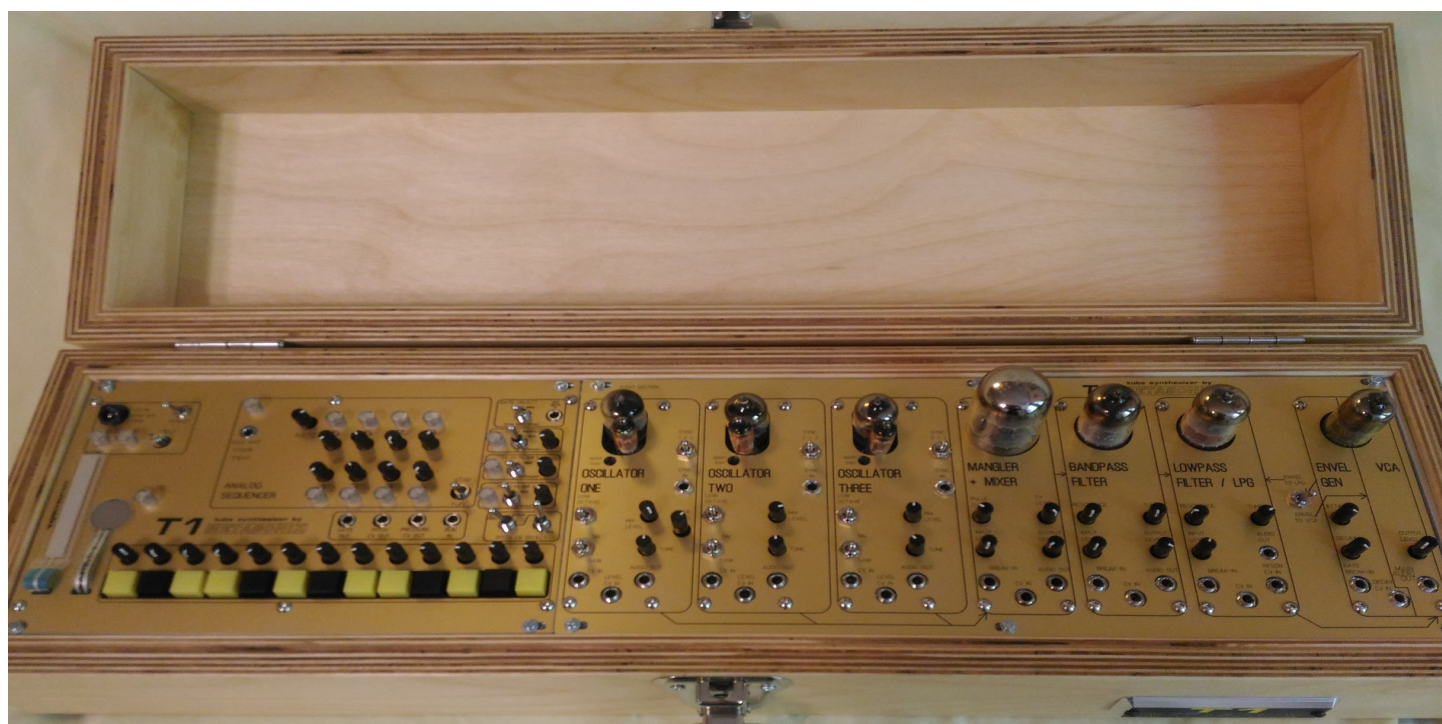
The knobs control the amount of strangle of the screaming voice. Turn them to the right for higher pitched screaming, and turn to the left for a tighter strangle and more choking. They go thru a mixer/mangler similar to the RK3 module, thence thru a bandpass filter similar to the RK4, then to a lowpass filter/LPG similar to the RK6. Finally there is a pentode VCA on the output, and one envelope generator to control either it or the LPG, selectable by the toggle switch between the LPG and envelope. There is only ONE envelope on this bastard thing, because it's supposed to be as primitive as possible. If you want to sweep the filter or suchlike, or you want an "LFO" thing, use the sequencer to do it. Or use external control-voltage sources. There were no such things as "envelope generators" or "LFOs" in the 1950s.

**I believe the common denominator of the Universe is not harmony,
but chaos, hostility and murder. – Werner Herzog**

You can control the pitch of the VCOs in three internal ways: the short ribbon controller at the extreme left; the 13-key keyboard, where each key has a trimpot to adjust its pitch so you can have any scale you want; and an 8-step analog sequencer.

Generally the T1 is a terrible, unruly, bad-tempered monster. A bit like an evil Music Easel. It is difficult to build because the thyatron tubes for the VCOs must be matched, and finding three of them to track reasonably well is a difficult and time consuming job. Tubes are evil little bastards that waste power and change in electrical characteristics as they age. This is why many controls have large "dead areas" in their ranges; we have to allow for tube drift and aging. If you don't like that, *send it back to the dealer* so they can sell it to another sucker. Or buy a bloody Knifonium, and deal with frequent retuning and similar issues, so you can get Moooog sounds. I don't care.

**What would an ocean be without a monster lurking in the dark?
It would be like sleep without dreams. – Werner Herzog**



HOW TO SET UP AND USE

The T1 needs 12 volts DC power at 2 amps, 5 amps during warm-up. Use **ONLY** a power supply capable of 12 volts DC at 5 amps or more. **DO NOT** attempt to power it with AC, you will **DAMAGE IT AND THE POWER SUPPLY**. **DO NOT** experiment with random power adapters. The power connector is a 2.1mm coaxial type. Center positive **ONLY**.

Yes, you can power it from a large 12 volt battery for portable use, via a special power cable. It depends on the type of battery used. **DO NOT** try to run it from USB power—the voltage is not enough. **DO NOT** try random power supplies. And get the polarity right, dammit.

Connect the main audio output (the right-most 1/8" jack on the T1 panel) to an amplifier or PA, set **ALL** the knobs on the T1 fully counterclockwise, and turn on the T1 power switch.

You should see the three power lamps on the extreme left come on, indicating the +12v, 12v and +95v power supplies are working. If one does not switch on, you have a bad power supply. **Allow at least one minute for warm-up.**

(The tubes might glow visibly, or they might not. It depends on the manufacturer and their particular design. Do not whine at us that the T1 is "broken" if you can't see a tube glow. The only way to know the T1 is working properly is to hear sound from the output.)

**The universe is not harmonious: you know that
by looking outside. – Werner Herzog**

The idiot/beginner's chicken starting instructions:

First we will explain the controller/CV section to the left. It consists of a single controller that generates pitch CV plus a 0-10 volt gate signal. The ribbon controller AND the tunable keyboard are both connected to this control circuit at all times, and may be played in parallel. Thus the ribbon can be used to bend pitches played on the keyboard. Since the CVs produced are simply mixed, and not offsetting each other, and the VCOs do not track like conventional ones, some skill and practice will be needed to obtain “conventional” results.



Note that to control the T1's oscillators and envelope with the main controller, the GATE SELECT switch at the right of the panel must be set to “from kbd/ribbon”. And the two PITCH CV SELECT switches must be set to “kbd/ribbon” on the left switch, and UP on the right switch. If you don't do this you won't get pitch control or open the envelope.

The keyboard has 13 keys to give one octave of equal tempering. They can control the VCOs over a maximum of about one and a half octaves. A key will NOT sound until you turn its corresponding tuning knob to above the 9-o'clock position; thereafter you will get the one and one-half octave range.

The ribbon (rectangular bar at extreme right) gives about the same 1-1/2 octaves of control, and triggers the gate when pressed anywhere on its length. Either the ribbon or the keyboard can be used to play the T1.

Next to the ribbon controller is a round pressure controller. It is used to effect various CVs and will be covered later.

To start, set the controls as follows:

- a) Controller settings as above
- b) all the "CV TO" switches to middle position (off)
- c) VCO 1 is started with: set the toggle switches to LOW OCTAVE (up) and SAW (down). Set the MIX LEVEL to 12 o'clock. Set TUNE to about 8 o'clock. Set all the SYNC switches DOWN, and keep the levels of the other two VCOs off for now. Keep the Noise knob all the way down.
- d) set the Mangler/Mixer: INPUT LEVEL to 10 o'clock, OUTPUT LEVEL to 12 o'clock, PULSE TUNE fully down, and CV LEVEL fully down. INPUT LEVEL can be used to overdrive this circuit so if you desire more clipping distortion, turn it up.
- e) set the Bandpass Filter: both LEVEL controls fully up, RESONANCE and TUNE to 12 o'clock.
- f) set the Lowpass Filter/LPG: INPUT LEVEL fully UP, RESONANCE to 12 o'clock, TUNE fully up.
- g) set the envelope: ENVEL SELECTOR to VCA, ATTACK and DECAY as desired, and OUTPUT LEVEL to a comfortable volume on your monitor amplifier or PA system.

Now press the ribbon controller. You should see the GATE light go on, and you should hear the low pitch of VCO 1. Slide your finger up the ribbon and the pitch should rise. Set the OCTAVE switch on the VCO down and the pitch will rise about 2 octaves (not exact). Set the SAW/SIN switch to SIN and the VCO will produce a quieter sine-like tone with few overtones. The SAW setting is the most generally useful. TUNE can be used to tune the VCO, especially when 2 or 3 of the VCOs are used together and need

to be detuned.



Turn the PULSE TUNE knob on the Mangler clockwise. At a certain point it will break into oscillation. If set to right at the point of breakover, it can be used to generate a sharp pulse effect to add harmonic content to the VCO. The CV LEVEL will be covered in the next section.

Adjust RESONANCE on the bandpass filter and turn TUNE fully clockwise, until you hear the filter oscillating on top of the VCO. Back off the RESONANCE slightly until the filter becomes usable as a sound effect. Like our RK4 filter, it's not a very good bandpass filter but may be used as a sound effect.

The Lowpass Filter/LPG section can be used as a simple lowpass filter. Turn TUNE down to hear the lowpass effect on the VCO tone. The RESONANCE effect only produces oscillation or peaking over a small range but is another sound effect that can be used to some effect by a careful operator.

So far we have used the regular VCA on the output to control the contour of the sound. Set the switch to ENVEL TO LPG. The VCA will be set to remain fully open, and the lowpass filter will be used as a lowpass gate in the Buchla manner. The TUNE control on the filter will be overridden, though you can still meddle with the RESONANCE for added sound effects.

Now you can use the other VCOs. Turn up their levels—the ranges of their level controls will be different from VCO 1. Adjust TUNE on each one so they track more-or-

less with VCO 1. It is normal for them not to track perfectly; if you really want them to track together, use the SYNC switches and adjust their output levels to get the best results. (Note that if a VCO is set to SIN output, it will not sync the next VCO as well as the SAW setting.) As with all things in the T1, these controls interact and do not behave cleanly or reliably.

The NOISE knob on VCO 1 adds some white noise to the output, for sound effects. The VCO levels must be adjusted to suit the effect desired.

There, now you're a tube synthesist. No one said it was "easy" or "traditional". You just went back in time 60 years technologically.

Look into the eyes of a chicken and you will see real stupidity. It is a kind of bottomless stupidity, a fiendish stupidity. They are the most horrifying, cannibalistic and nightmarish creatures in the world. – Werner Herzog

The sequencer and CV effects, for Godardian cool people:

Unlike most other monosynths, the T1 contains an eight-step analog sequencer. You can control the pitch of the VCOs using the sequencer: first set the GATE SELECT switch to "from seq" and the right-hand PITCH CV SELECT switch to "seq". Set the run/stop switch to "run". Adjust RATE to a slow speed. Then adjust the pots for each stage until you hear the pitch. If a knob is set below 9 o'clock, that stage will be skipped with no gate. Otherwise the pitch knobs for the eight stages operate like the keyboard knobs, giving about a 1 ½ octave range of control over each VCO. The RATE control works backwards from normal, with clockwise turning decreasing the switching rate. The LEDs will show when a stage is triggered. Yes, the run/stop switch does exactly that to the sequencer.

Next to the sequencer is the CV effect matrix. It is very primitive, and allows you to feed one of two CV sources to the mangler pulse effect, bandpass filter tuning, or lowpass filter tuning. The three circuits interact somewhat, keep that in mind. Set each switch UP to feed the CV output of the sequencer to the CV input of the module shown, then turn up the knob next to the switch to hear the effect.

Set the switch DOWN and the pressure sensor to the left will control the CV of that module. Press it with your finger and adjust the knob to hear the effect change with pressure.

The pressure sensor can also be used to control the VCO pitch. The gate would have to be triggered either by the controller or the sequencer; set the left PITCH CV SELECT switch to "press". Then you can sweep the VCO pitch with the pressure pad.

A set of jacks is provided on the controller panel. GATE OUT is just what it says, the 0-10v gate signal produced by the controller. PITCH CV OUT is the CV output of the controller, covering roughly a 0-4 volt range. PRESSURE CV OUT comes from the pressure sensor, and covers approximately 0-5 volts. RUN IN allow you to start and stop the sequencer; set the run/stop switch to stop, then you feed 0 volts to this input to RUN the sequencer, and +8v to STOP it.

The “seq ext clock input” will run the sequencer at a rate you can set, up to thousands of hertz. It needs at least a 0-8v clock square wave. And “ext gate in” allows external equipment to trigger the envelope, 0v for off and at least +8v for trigger on.

**Someone like Jean-Luc Godard is for me intellectual counterfeit money
when compared to a good kung fu film. – Werner Herzog**

Tuning the keyboard:

Plug your monitor amp into the audio OUTPUT of the first VCO. Set TUNE to the 9 o'clock position and adjust LEVEL for a reasonable volume. Attach a chromatic tuner in parallel with the monitor amp (might need a Y-cable). Set the octave switch either up or down depending on your need for bass or treble range. (Make sure all the SYNC switches are OFF for this procedure.)

Press and hold the leftmost key. Adjust the knob above it to get a D. Do the same with the next key, to obtain a D#. Then the next, to give an E. Go all the way across the keyboard and tune each key for equal tempering. Or tune the keys to any nonstandard pitch set you prefer.

Once the keyboard is tuned for oscillator 1, move the cable to oscillator 2's output and adjust the level. Press the lower D key and adjust TUNE to get a D. Then press the G key in the middle of the keyboard, and adjust the SPAN trimpot with a small screwdriver (it is recessed in a hole below the tubes) to get as close to a G as possible. Repeat this process for oscillator 3.

Be warned: tubes drift and you may have to redo this tuning occasionally.

For advanced users:

Each analog circuit in the T1 (right-hand panel) is similar to one of our RK modules, with a few modifications, like the VCO sync and the switch that selects VCA or LPG effect. The audio input jack on each module is a “break-in” jack, allowing you to insert an external audio signal and have it replace the T1's internal signals. Thus the individual modules may be used separately.

The “sync in” jacks on each VCO allow you to sync them to external pulse waveforms. They must have fast rise or fall times to work properly. The sync in this VCO is neither “hard” nor “soft”. It’s *primitive*. Find a use for it.

Adjusting the VCOs to track together might require adjusting the “span” trimpots behind the labeled holes on the panel.

The VCA has a couple of inputs. The audio break-in allows you to use the VCA separately (the internal envelope will have to be triggered). The “Decay CV in” jack provides a crude control of the decay time—turn the knob fully clockwise and feed this jack a 0-3v CV to control decay.

Attached to this manual are the original manuals for the RK7, RK3, RK4 and RK6 modules for reference. You really should feed them “hot” signals, in typical modular-synth ranges, for best results. The mangler is an exception, it is usable even with relatively weak inputs, 0.5v p-p or less.

The T1 is in a massive marine-plywood box for a good reason. In spite of our 20+ years of experience, and our best efforts, it is not especially “rugged” or well suited to road life. The box will protect it—up to a point. Keep it in your studio unless you are willing to put an extra effort into protecting it from mechanical damage.

**The universe is monstrously indifferent
to the presence of man. – Werner Herzog**

(If the above doesn't give you some ideas on how to apply your shiny T1, you are worthless and an incompetent musician. Eat some more THC gummies and return it to the dealer.)

MAINTENANCE

WARNING: If you aren't familiar with the innards of tube electronics,
DO NOT OPEN THE T1. It is a VERY complex device.

There is a 95v dc power supply inside!!! Danger!!!!



The T1's tubes used are no longer made. Fear not. The tubes are run VERY conservatively and should last decades if not abused or left running for years at a time. All these tubes are still

available in NOS form, and not available from your friendly guitar dealer. Try Antique Electronic Supply (www.tubesandmore.com) or Radio Electric Supply (www.vacuumtubes.net).

The T1 uses ten tubes:

1. Each VCO uses a 5696 thyatron and a 5702 subminiature pentode. The latter is soldered into its PC board and has to be unsoldered to be changed.
2. the mixer/mangler uses a 14BL11 compactron dual triode-pentode.
3. the bandpass filter uses a 6U8, 6GH8, 6CQ8 or similar triode-pentode.
4. the LPG/filter uses a 17JK8 dual triode. It can also accept a 12AT7 or 12AV7.
5. The output VCA uses a 12AV6, a 12AU6 will also work.

The tubes are being run conservatively, and should last for many, many years. Do NOT listen to guitar amp “tech gurus”. They know very little, and have never seen this circuit before. Check with us BEFORE YOU DO SOMETHING STUPID. Thank you.

Replacing the tubes can be a bit difficult. We deliberately use socketing that is very “tight” to keep tubes from falling out in shipment. Removing and installing a tube might require disassembly of the T1 from its cabinet to see the PC board and maneuver the tube pins out of or into the socket.

The T1 uses a low-voltage “polyfuse” self-resetting fuse. It is soldered to the PC board, and should never need replacement. If the polyfuse opens repeatedly, you are probably feeding the T1 too much DC voltage, or there is a shorted semiconductor in it.

The trees are in misery, and the birds are in misery. I don’t think they sing. They just screech in pain. ...Taking a close look at what’s around us, there is some sort of harmony: it’s the harmony of overwhelming and collective murder.
– Werner Herzog

OTHER CRAP

Audio outputs: 1000 ohm unbalanced, suitable to drive 600-ohm inputs, maximum level +20dBm. CV inputs: maximum range -5v to +5v DC. **All controls may interact with unrelated controls.** Individual audio outputs for each section may not be fully isolated from the other voices. CV and trigger pulses are not fully isolated from the outputs. There may be hum, noise and crosstalk on all inputs and outputs -- *get used to it*.

It's an extremely primitive synth, and if you don't like that, we can only say: *why did you buy the damned thing*, and then we say, *send it back immediately*, we have plenty of other customers who want one. Then you are welcome to return to your first love: sodomizing a Moooooooooog.

I think there should be holy war against yoga classes. --Werner Herzog

(text is copyright 2021-2025 Metasonix. All rights reserved. It is a violation of federal law to reproduce, reuse or duplicate this publication without the express written permission of Metasonix or its assigned representative.) (Oh, you want to FIX it? You say you want a SCHEMATIC?? Oh, that's PRICELESS. Contact us at METASONIX. 495 N. Main #109, Lakeport CA 95453, (707) 245-9162, synth@metasonix.com. We'll arrange for repair, while refusing to give you a schematic. “I am a product of my failures.” - Werner Herzog)



RK7 Thyatron VCO User's Manual

Copyright 2020 – 2100 Metasonix. All rights reserved.

READ ALL OF THIS, DAMMIT!!!!!!!!!!

RETAIN INSTRUCTIONS: The safety and operating instructions should be retained for future reference. Or, you can choose to be a dumbfuck and toss it. But we'd advise the former.

HEED WARNINGS: All warnings on the RK7 and in the operating instructions should be adhered to – unless you want to wind up in a fucking morgue. Oh wait, you don't? Great, then finish reading the manual, you incel.

FOLLOW INSTRUCTIONS: All operating instructions should be followed. It's not that hard.

WATER AND MOISTURE: The RK7 should not be used near water (like in a bathtub, washbowl, kitchen sink, tub, wet basement, near a swimming pool, in urine, etc.). Care should be taken so that liquids are not spilled onto or near the enclosure.

VENTILATION AND COOLING: The RK7 normally operates warm to the touch. It **MUST** be situated so that its location or position does not interfere with convective cooling. The RK7 **MUST NOT** be used on a bed, sofa rug or similar surface which may prevent proper cooling. **IT IS NOT A SEX TOY. DO NOT STICK IT IN YOUR ASS.** If you do, **THIS WILL VOID YOUR WARRANTY.** If the RK7 is mounted in a synthesizer rack or other built-in installation, space *must* be left around it to allow convection cooling.

HEAT: The RK7 **MUST** be situated away from heat sources such as radiators, heat registers, stoves, or other devices (including power amps and your mother's vibrator) that produce heat.

POWER SOURCE: The RK7 should be connected to a power supply **ONLY** of the type described in the operating manual or as marked on the RK7. It uses +12v at about 210mA and -12v at 10mA, and draws about 500mA when first powered on (dropping to roughly 210mA after a few seconds). The power input is a standard Doepfer™ 10-pin IDC type, with the -12v pins on the **BOTTOM**. A cable adapting the 10-pin inlet to a standard 16-pin busboard is included.

CLEANING: The RK7 should only be cleaned with a soft cloth moistened with water. Unplug the power supply before attempting to clean. Don't be a fucking idiot.

NON-USE PERIODS: The RK7 should be shut off when left unused for a long period of time.

shit

DAMAGE OR TUBE REPLACEMENT REQUIRING SERVICE:

The RK7 should be serviced by qualified service personnel when:

fuck

- The power supply has been damaged;
- The RK7 has been dropped, physically damaged, or subjected to force;
- Liquid has been spilled onto the RK7, or it has been exposed to rain;
- The RK7 does not appear to operate normally or exhibits a marked change in performance

SERVICING: The user should not attempt to service the RK7. You're mentally incapable of fixing this shit – don't try it dammit. All servicing should be referred to qualified service personnel (duh).

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!!!

The 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 is prohibited. This includes, but is not limited to: incorporation of the product into any other products, damage to the product caused by accident, fire, floods, lightning, acts of God, any violation of instructions furnished by Metasonix, or whatever other crazy shit you can come up with.

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, with 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 explaining why you were incapable of doing something right for once in your goddamn life.

IMPORTANT:

To save yourself unnecessary cost and inconvenience, please check carefully that you have fully read and followed the instructions in this instruction manual. fuck

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 MERCHANT ABILITY 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:

fuck

The RK7 is an 8HP Eurorack version of our legendary TM-3/S-1000/R-55 VCO circuit. The entire circuit is based on two tubes: a 5696 thyratron and a 5702 subminiature pentode, both of which are military surplus tubes used in avionics. The 5696s are still available but getting scarce, and they require a higher plate voltage than our other Euro modules. Like the R-55, the RK7 has a pentode clipping stage which provides voltage control over the gain and clipping level. 5702 subminiature pentodes have always been rare and little used outside military equipment.

The RK7 is profoundly weird and erratic. Don't expect it to be perfect – it's far from that. We've been making products with them for 20 years and still can't figure out the whole situation. Apart from the early Trautonium in the 1930s, no one ever used thyratrons as music VCOs before.

The Pitch and VCA CV Inputs accept -10v to +10v with minimum 50k ohm input impedances. The Pitch CV Input is limited to +/-10v range, the usable pitch control CV is roughly 0-4 volts, depending on the setting of the SPAN trimpot. The VCA CV input uses bipolar CVs (such as LFOs) or audio signals, and cannot be damaged by over-voltage.

OCTAVE lowers the pitch of the VCO roughly two octaves when pushed up.

SIN/SAW switches between crude variances of a sine and sawtooth waveform.

DRIVE enables waveform clipping and gain level from the pentode. When set above 10 o'clock, the waveform will begin clipping.

Jesus fuck

TUNE enables master tuning of the entire pitch range. It only follows an approximate Hz/volt CV over slightly more than 2 octaves. A SPAN trimpot is accessible thru the front panel of the RK7 (below the tubes) for re-tuning. Accessing this trimpot might require some care, or removing the front panel. BEWARE OF THE HIGH VOLTAGES AROUND THE TUBES, you jackoff.

Unlike the R-55, the RK7 can self-oscillate without the need of an external VCO applied to the Pitch CV Input. But it's advised that you apply an external square/pulse wave VCO to this input, to force the RK7 to sync to the external VCO, if you prefer a more "stable and conventional" pitch range. This oscillator is always unstable and its waveforms are "uncharacteristic" of any other VCO on the market, like its predecessors. It drifts for no apparent reason, temperature has little effect. Have fun keeping it from drifting.

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.

USAGE

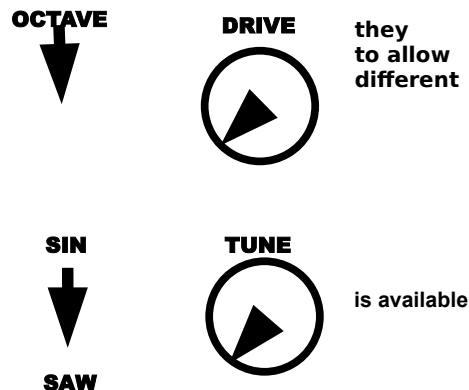
For typical use as a sine/sawtooth VCO, adjust the RK7 controls approximately as shown:

Note that the RK7 controls have considerable "extra range" beyond what absolutely need. This is made necessary by variations in tube samples and for tube aging. Do not assume these settings are written in stone, and if a setting gives optimum results for your RK7, this is normal. Because it is likely to be totally different from any other synthesizer VCO you have ever used, you may be surprised by some of its quirks.

Set TUNE and DRIVE around 8 o'clock, the RK7 will begin to self-oscillate. You may adjust the pitch accordingly. Increasing DRIVE will clip the waveform into a square wave at lower pitches when set as a sawtooth. The RK7's output is VERY HOT, as much as 20v p-p at maximum output.

When switching to the waveform to SIN (sine), the output level will drop suddenly due to the waveform lacking any harmonics. This is natural, so turning DRIVE further clockwise will make up for the lost amplitude.

The RK7 is also capable of being used for distortion. Simply apply an audio-rate signal to the VCA CV Input and adjust controls however you see fit. Note that SAW is abrasive, so adjust TUNE lightly. The VCO waveform could override the original input signal.



ADJUSTMENTS

The RK7 is adjusted at the factory so the first octave occurs with CV from 0.0v to ~1.0v, and the second octave from ~1.0v to ~3.0v. This is similar to what the Kenton™ MIDI-CV interfaces produce when set to Hz-V output. The RK7's CV span may be readjusted for other interfaces via the trimpot visible below the tubes in the open hole on the front panel. Note that the RK7 WILL NOT track with conventional solid-state VCOs using 1v/Oct CV.

The adjustment procedure is similar to that used on the S-1000 and R-55, and requires a suitable tuning tool (included), a chromatic tuner or frequency counter, and some patience. Note: The Metasonix R-60 MIDI-CV may be used, although its auto-tuning cycle might not work properly with the RK7's bizarre signal.

Connect the AUDIO OUTPUT of the VCO to be aligned to a chromatic tuner or other method of determining equal-tempered pitch. Adjust OUTPUT LEVEL so the tuner is showing a stable reading. Set TUNE to center point.

1) Press and hold a low C (usually MIDI note 36 - use the controller's octave selector to obtain the correct range). Adjust the trimpot on the RK7 until the low C is obtained.

2) Press the C one octave ABOVE. Adjust trimpot until the C one octave up is obtained.

3) Press the lower C and readjust the trimpot. It may help to adjust TUNE slightly.

4) Repeat the steps until the two Cs are within 10 cents of the correct pitch. Please note that due to the variations of the thyratron tube, there may be small variations from equal tempering between the two Cs, and in the range above them.

MAINTENANCE

Powering the RK7 requires a power supply producing +12v DC at 210mA, and -12v DC at 10mA (when first powered on, the RK7 briefly draws about 2-3 times 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 RK7 load plus the load of other modules. Doepfer's A-100PSU2 or A-100PSU3 are both adequate to run up to five Metasonix RK modules with no other loads. If the power supply shuts down, you have overloaded it. It will not be damaged, but you will be forced to wait until it cools off. The Metasonix RKP power supply is also available, especially if your existing cabinet has limited power capacity. Many low-cost Eurorack switching supplies, like the ones offered by TipTop Audio or other firms, will have difficulty powering the RK7.

The tubes in the RK7 run VERY conservatively. They should last for tens of thousands of hours of normal use. Still, the RK7 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 its expected long lifetime, the tubes might be damaged or develop faulty internal wiring connections, requiring replacement. The RK7 was shipped and wired for 5696s and 5702s. The 5696 is socketed and can be replaced by the user; the 5702 is soldered to the PC board. **No other tube types are compatible with this module.**

NOTE: Most of the switching-type Euro power supplies currently on the market will have trouble powering the RK7. Because tube heaters draw much more than rated current when powered on cold, a power supply should be chosen to have excess current capacity – 250 to 300% of the operating current draw is recommended, especially if a switching power supply is used to power tube heaters.

PLEASE CONSULT WITH METASONIX BEFORE PERFORMING ANY MODIFICATIONS.

Such changes can damage the module or the power supply if the wrong tube type is installed.

Don't experiment blindly!

It's possible to operate Metasonix RK modules on +/-15v power supplies. This is NOT a trivial modification. It requires a proper power connector and a power dropping resistor in the +15v line, to prevent applying excess voltage to the tube heaters. Contact Metasonix before attempting it.

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!

METASONIX

495 N. Main #109
LAKEPORT, CA 95453 USA
synth@metasonix.com
www.metasonix.com

Manual written by Ethan Carlson
The 27th Parallel / Delepathy

General Testimonials:

"penispenispenispenispenispenispenispenispenispenis"

- Michael Weeks (*The Wretch*)

"I've been ogling and obsessing over Metasonix since the summer of '05. From the first Boy George song I heard mangled by the Butt Probe to the early works of *The Wretch* (which lead to a lifelong friendship). Over the years I've come to love my Assblaster, Horsecocks, and Scrotum Smasher for their ability to completely transform the sounds of my all my gear. Whenever I get new gear, the first thing I do is run it through as much of my Metasonix gear as possible just to see what happens. Eric's always been quick to check out gear if I was paranoid about it. He's also built me custom gear (after much pestering from me). I have the entire TM, S-, D-, and KV series, including most of the R- and RK modules. I no longer view Metasonix as parts of my synthesizer, but as an untamable instrument all its own. I don't play synthesizers – I play Metasonix."

- Sean Richer (*Anatolia's Finest*)



RK3 ringmod/waveshaper user's manual

Copyright 2017-2022 Metasonix. All rights reserved.

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

RETAIN INSTRUCTIONS: The safety and operating instructions should be retained for future reference.

HEED WARNINGS: All warnings on the RK3 and in the operating instructions should be adhered to.

FOLLOW INSTRUCTIONS: All operating instructions should be followed.

WATER AND MOISTURE: The RK3 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 RK3 normally operates warm to the touch. It **MUST** be situated so that its location or position does not interfere with convective cooling. The RK3 **MUST NOT** be used on a bed, sofa rug or similar surface which may prevent proper cooling. It is **NOT** a toy. If the RK3 is mounted in a synthesizer rack or other built-in installation, space *must* be left around it to allow convection cooling.

HEAT: The RK3 **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 RK3 should be connected to a power supply **ONLY** of the type described in the operating manual or as marked on the RK3. It uses +12v at about 400 mA and -12v at 10 mA, and draws about 800 mA when first powered on (dropping to ~400 mA after a few seconds). The power input is a standard Doepfer (tm) 16-pin IDC type, with the -12v pins on the **BOTTOM**. The pins above the +12v pin row are not used and not connected.

CLEANING: The RK3 should only be cleaned with a soft cloth moistened with water. Unplug the power supply before attempting to clean.

NON-USE PERIODS: The RK3 should be shut off when left unused for a long period of time.

DAMAGE OR TUBE REPLACEMENT REQUIRING SERVICE:

The RK3 should be serviced by qualified service personnel when:

- The power supply has been damaged;
- The RK3 has been dropped, physically damaged, or subjected to force;
- Liquid has been spilled onto the RK3 or it has been exposed to rain;
- The RK3 does not appear to operate normally or exhibits a marked change in performance.

SERVICING: The user should not attempt to service the RK3. 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:

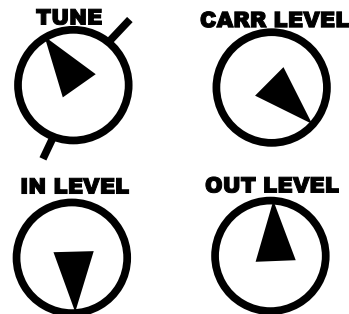
The RK3 is an 8hp Eurorack version of our legendary R-53/TM-1 waveshaper and ring modulator circuit. The entire circuit is based on a single tube, a 14BL11 dual triode plus pentode, and works in the same fashion as the R-53 circuit. It behaves as a primitive pulse generator, adding badly-formed pulses which synchronize to the input waveform erratically. This circuit feeds a simple ring modulator based on the tube's pentode. Main input signal enters the tube via the control grid, and the carrier modulation signal effects the tubes' screen grid. The RK3 is optimized for general use in the *professional* modular synthesizer studio. All panel inputs and outputs are compatible with other synthesizer modules, and cannot damage other modules connected to them.

The audio input and carrier/CV input are both 500k ohms 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 input can accept changing CVs (such as LFOs) or audio signals, and is limited to +/-10v range.

USAGE

To begin experimentation, adjust the RK3 controls approximately as shown:

Drive the input with a strong signal and adjust input and output volumes as needed. Simple tube distortion can be obtained without using the pulser, which will usually be disabled when TUNE is fully clockwise or counterclockwise. Note that the output level may not be as "hot" as most conventional Euro modules, but it should be enough to be usable with them.

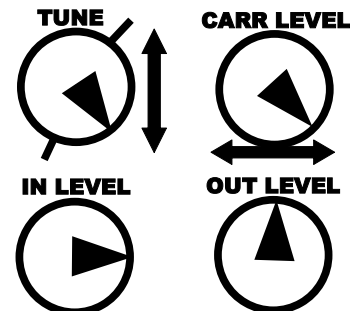


The pulser circuit works best with waveforms having sharp transitions, such as square or sawtooth waves or digitized audio. (Acoustic instrument or electric guitar usually do NOT work well with the pulser.)

To explore the pulser, adjust the controls as shown:

Twiddle the TUNE knob while feeding signal to the input, and observe how the pulser tries to "track" the input pitch. The markings on the TUNE knob show roughly where the pulser starts to work. Some find the best setting to be at the point where the pulser just begins to be noticeable – turning it further clockwise will cause the pulser to break into oscillation, which may or may not be useful, depending on personal preference and the nature of the input signal. It will also interact with input level settings.

You may try feeding the CV/carrier IN a strong audio signal. It modulates the input signal via the pentode VCA, giving a unique ring modulation effect. You can also feed a CV here. It interacts with the pulser circuit somewhat so a CV fed to this input can also be useful for sound effects.



To experiment with the ring-modulator function, run a strong audio signal into the CV/carrier INPUT and set the controls as above. Turn CARR LEVEL *clockwise* until you hear the carrier input effecting the main signal. Changing the pitch of the carrier signal will cause a noticeable sum-difference cancellation effect. You will hear heterodyne "beating" when the carrier pitch is close to the pitch of the input signal. (Note: the RK3 ringmod function is not like other ring modulators -- it DOES NOT completely suppress the carrier signal, you will always hear some carrier mixed into the output. This is NORMAL and an unavoidable characteristic of this kind of primitive circuit design. Learn to use this effect, it will not sound like conventional ringmods.)

The ringmod and pulser may be used simultaneously. The ability to combine audio signals via the regular input and the CV/carrier input allows for a vast range of unique and very complex tonal effects.

Note that the RK3 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 RK3, this is normal. Because the RK3 is totally different from any other synthesizer module you have ever used, you may be surprised by some of its quirks. Learn to exploit them, and you'll make sounds that other modular synthesists can only dream of.

MAINTENANCE

Powering the RK3 requires a power supply producing +12 volts DC, at 400 milliamps (when first powered on, the RK3 briefly draws about 2-3 times greater current, so be aware of this when using a power supply to run it plus other modules.) Plus -12 volts DC at 10 mA. You MUST assure the power supply is able to handle the RK3 load plus the load of other modules. Doepfer's A-100PSU2 or A-100PSU3 are both adequate to run up to five Metasonix RK-modules with no other loads. If the power supply shuts down, you have overloaded it. (It will not be damaged but you will be forced to wait until it cools off.) The Metasonix RK-P power supply is also available, especially if your existing cabinet has limited power capacity. Many low-cost switching supplies, like the ones offered by Tip-Top Audio or other firms, will have difficulty powering the RK3.

The tube in the RK3 is being run VERY conservatively. It should last for tens of thousands of hours of normal use. Still, the RK3 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 TUBE 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 its expected long lifetime, the tube might be damaged or develop faulty internal wiring connections, requiring replacement. This particular RK3 was shipped, and wired for, a 14BL11 and no other type.

NOTE: Most of the switching-type Euro power supplies currently on the market will have trouble powering the RK3. Because tube heaters draw much more than rated current when powered on cold, a power supply should be chosen to have excess current capacity—250 to 300% of the operating current draw is recommended, especially if a switching power supply is used to power tube heaters.

PLEASE CONSULT WITH METASONIX BEFORE PERFORMING ANY MODIFICATIONS. Such changes can damage the module or the power supply if the wrong tube type is installed. Don't experiment blindly!

It is possible to operate Metasonix RK modules on +-15v power supplies. This is NOT a trivial modification. It requires a proper power connector and a power dropping resistor in the +15v line, to prevent applying excess voltage to the tube heater. Contact Metasonix before attempting it.

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!

METASONIX

495 N. Main #109
LAKEPORT CA 95453 USA
synth@metasonix.com
www.metasonix.com



RK4 oscillator/filter user's manual

Copyright 2017-2022 Metasonix. All rights reserved.

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

RETAIN INSTRUCTIONS: The safety and operating instructions should be retained for future reference.

HEED WARNINGS: All warnings on the RK4 and in the operating instructions should be adhered to.

FOLLOW INSTRUCTIONS: All operating instructions should be followed.

WATER AND MOISTURE: The RK4 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 RK4 normally operates quite warm to the touch. It **MUST** be situated so that its location or position does not interfere with convective cooling. The RK4 **MUST NOT** be used on a bed, sofa rug or similar surface which may prevent proper cooling. It is **NOT** a toy. If the RK4 is mounted in a synthesizer rack or other built-in installation, space *must* be left around it to allow convection cooling. Beware of the heated panel above the tube.

HEAT: The RK4 **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 RK4 should be connected to a power supply **ONLY** of the type described in the operating manual or as marked on the RK4. It uses +12v at 450 mA, and 10 ma at -12v, and draws about 800 mA from +12v when first powered on (dropping to ~450 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 RK4 should only be cleaned with a soft cloth moistened with water. Unplug the power supply before attempting to clean.

NON-USE PERIODS: The RK4 should be shut off when left unused for a long period of time.

DAMAGE OR TUBE REPLACEMENT REQUIRING SERVICE:

The RK4 should be serviced by qualified service personnel when:

- The power supply has been damaged;
- The RK4 has been dropped, physically damaged, or subjected to force;
- Liquid has been spilled onto the RK4 or it has been exposed to rain;
- The RK4 does not appear to operate normally or exhibits a marked change in performance.

SERVICING: The user should not attempt to service the RK4. 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 RK4 is an 8hp Eurorack module replicating the basic function of the older R-54 "Supermodule". It is a vacuum-tube (electronic valve) Wien-bridge bandpass filter which can also be used as an oscillator. Tuning is effected by a dual-element Vactrol optocoupler.

TUNING tunes the circuit through its full sweep range, from below 20 Hz to more than 5 kHz, manually. RESONANCE controls the resonance when used as a filter, and sets/adjusts the waveform in VCO mode. Adjust RESONANCE to the marked dot on the panel for a reasonably-low-distortion sinewave output. Turning it farther counter-clockwise will increase distortion. 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 RK4 as a straight VCO, do not plug a cable into the audio INPUT.

By applying an audio signal to the AUDIO INPUT, the RK4 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). When used as a filter, the RESONANCE setting has to be carefully adjusted (somewhere near the dot marking) for best results.

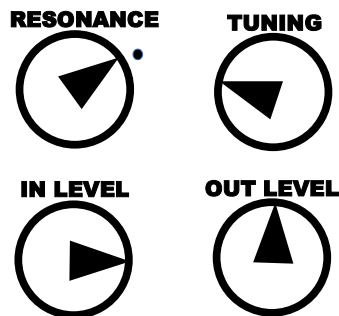
The PITCH CV INPUT controls the module's frequency with a control range of approximately 0-4 volts, with the TUNING control offsetting the center frequency in parallel. Thus, the CV input will accept a broad range of effective CV changes. The maximum sweep range is about 8 octaves, and the PITCH CV INPUT does not track conventional solid-state VCO or filter responses (it is approximately linear or Hz/v except in the lowest octave, and V/oct CV will not give accurate pitch tracking). If tracking of other VCOs or v/oct is required, an RK4 can be forced to track a conventional VCO over a small range by feeding a "hot" VCO signal into the CV input. 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 the CV input has 500k ohms 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 input is limited to +-10v range.

USAGE

For typical use as a sine-wave VCO, adjust the RK4 controls approximately as shown:

Note that the RK4 controls have considerable "extra range" or "slop" 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 RK4, this is normal. Because the RK4 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 RESONANCE knob indicates where the best setting is for low-distortion sine wave production. By turning RESONANCE further to the left (counterclockwise), the VCO waveform can be made distorted in a manner unique to this circuit. (Note that RESONANCE interacts with the VCO pitch slightly. This is normal.)

Now set RESONANCE to the mark point on the panel. Inject a line-level audio signal into the AUDIO INPUT. Instantly, the RK4 changes into a bandpass filter. 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). Care must be taken in RESONANCE adjustment to get the best bandpass filter effect.

MAINTENANCE

Powering the RK4 requires a power supply producing 12 volts DC, at 450 milliamps, plus 10 ma at -12 volts DC. when first powered on, the RK4 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 RK4 load plus the load of other modules. Doepfer's A-100PSU2 or A-100PSU3 are each adequate to run up to 5 Metasonix RK modules with no other loads.

The tube in the RK4 is being run VERY conservatively. It should last for tens of thousands of hours of normal use. Still, the RK4 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 TUBE 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 its expected long lifetime, the tube might be damaged or develop faulty internal wiring connections, requiring replacement. This particular RK4 was shipped, and wired for, a 6GH8, 6U8 or 6CQ8 (or European equivalent, such as ECF82) triode-pentode. Those types are MANDATORY for use in the RK4, 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).

Note: this is an ADVANCED MODIFICATION and is NOT RECOMMENDED for inexperienced personnel.

RK series modules can be modified to accept +-15v power supply rails. 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 a dropping resistor in the positive supply line (to limit the voltage fed to the tube heater) and a suitable power 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!

METASONIX

495 N. Main #109
LAKEPORT CA 95453 USA
e-mail synth@metasonix.com
www.metasonix.com



RK6 RESONANT LOWPASS FILTER user's manual

Copyright 2018 Metasonix. All rights reserved.

Please read all of this before using it!

RETAIN INSTRUCTIONS: The safety and operating instructions should be retained for future reference.

HEED WARNINGS: All warnings on the RK6 and in the operating instructions should be adhered to.

FOLLOW INSTRUCTIONS: All operating instructions should be followed.

WATER AND MOISTURE: The RK6 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 RK6 normally operates warm to the touch. The tube generates considerable heat. It **MUST** be situated so that its location or position does not interfere with convective cooling. The RK6 **MUST NOT** be used on a bed, sofa rug or similar surface which may prevent proper cooling. It is **NOT** a toy. If the RK6 is mounted in a synthesizer rack or other built-in installation, space *must* be left around it to allow convection cooling. Use great caution if handling the RK6 when it is powered up.

HEAT: The RK6 **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 RK6 should be connected to a power supply **ONLY** of the type described in the operating manual or as marked on the RK6. **WARNING:** Each RK6 requires +12v at 100mA and -12v at 5 mA, with a brief transient consumption of 200 mA at first power-on. The cabinet power supply *must* be able to deliver this current. Most available switch-mode power supplies should be able to handle this load. **WARNING:** The tube becomes hot in normal operation and should not be touched after 10 minutes with power applied.

CLEANING: The RK6 should only be cleaned with a soft cloth moistened with water. Disconnect all possible power supplies before attempting to clean or handle.

NON-USE PERIODS: The RK6 should be shut off when left unused for a long period of time.

MECHANICAL: protect the RK6's tube from damage. Use of a Eurorack cabinet with a removable lid tall enough to protect the tube is recommended, if the synthesizer is to be moved or transported. Remove the tube from the socket if the cabinet's lid will not clear it.

DAMAGE OR TUBE REPLACEMENT REQUIRING SERVICE:

The RK6 should be serviced by qualified service personnel when:

- The power supply has been damaged;
- The RK6 has been dropped, physically damaged, or subjected to force;
- Liquid has been spilled onto the RK6 or it has been exposed to rain;
- The RK6 does not appear to operate normally or exhibits a marked change in performance.

SERVICING: The user should not attempt to service the RK6. 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 RK6 is a TOTALLY UNIQUE product, one that never existed before. It is a Sallen-Key lowpass filter with a feedback loop, to allow it to resonate. There are no integrated circuits or transistors in the signal path. It is a PURE TUBE design, the sort of design that might have been invented in the 1950s if anyone had dared to create a tunable lowpass filter for musical uses before Moog and Buchla. It even uses a coupling transformer to provide the proper phase of feedback signal --- purely a "classic good old days" approach, and one rarely seen in the 21st century. Two "vactrol" optocouplers tune the filter, and another coupler allows CV control of the filter's resonance.

The audio inputs have 500k ohm impedance. The CV inputs are about 3k ohms impedance and need to produce at least 3 mA to fully open the optocouplers. Signal gain with the filter fully open is about 0.9. The audio output is able to drive a 10k-ohm load (do not load it down with 600 ohms or you will lose a lot of signal volume).

USAGE

Connect the RK6 to an adequate Euro cabinet power supply. Connect an audio source to the INPUT, and connect its OUTPUT to a monitor speaker or headphone amplifier. The RK6 is quite easy to overdrive with a Euro-level audio signal so attenuation might be needed for best filtering effect. Adjust IN LEVEL as needed.

Connect an envelope generator or other CV source to the TUNING CV input. It should open the filter fully when the EG is triggered. The filter will be fully closed with 0v CV input, and opens fully when the CV reaches 3.0v, when the TUNE control is properly adjusted (it acts as an offset control). Between these points, the CV will make the RK6 channel act like a low-pass filter with two poles. It follows a more-or-less Hz/v tuning curve, and might be adjustable to track with a Hz/V VCO if desired; a CV attenuator and careful adjustment might be needed to get this effect.

The RESON CV input works in parallel with the RESONance control. Full variation of resonance is had from 0v to 2v when the control is adjusted properly. Note that full resonance oscillation will only occur at frequencies above 700-800 Hz and not in the bass region; this is normal and expected. Each RK6 is slightly different from each other one in behaviour and sound effects, so if you buy two of them, don't be surprised if they vary slightly.

If you want to use it as a lowpass gate and expect total muting when not triggered, use a VCA or a noise gate on the output of the RK6. Adjust TUNE appropriately and RESON to taste; beware of feedback "howling" when increasing resonance. When fully turned down there will be at least 40-50 dB of signal rejection; when fully open, the output signal will be close to 90% of the input signal level (no, the RK6 does NOT provide any signal gain). It's tubes, and it's BRUTE FORCE, so it won't be a "perfect filter". But it won't sound like anything else.

Note: The RK6 can NOT be damaged by signal overdrive. In fact, it is doubtful if even a lightning strike or electrostatic shock will damage it.

MAINTENANCE

The RK6 requires a power supply producing +12v at 100 mA and -12v at 5 mA. When first powered on, the RK6 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 RK6 load plus the load of other modules. Most power supplies on the market should be able to handle this load (although it depends on how many other modules are being powered from the same supply). The tube in the RK6 is being run VERY conservatively. It should last for tens of thousands of hours of normal use. Still, the tube produces a lot of waste heat, so we recommend shutting power off when not in use.

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

Please note: not all tubes have easily visible heaters. They were not designed to offer pretty cosmetics. If you can't see a heater glowing, DO NOT assume that tube is bad. If you hear an output signal, the RK6 tube is working. We get many foolish complaints of this type!

TUBE REPLACEMENT: despite its expected long lifetime, the tube might be damaged or develop faulty internal wiring connections, requiring replacement. This particular RK6 was shipped, and wired for, a 17JK8 dual dissimilar triode. It is possible to use a few other tube types in the RK6 without modification; types with low plate resistance, a heater of 12.6v to 20v, and pinout 9A will work. We would recommend 12AT7s, 12AU7s, 12AV7/5965, or a few similar types. Be warned that other types will draw more current from the power supply than the 17JK8 and may not behave the same way. **Experiment at your own risk.** We recommend sticking with the original tube type; there is no worry about finding them, as 17JK8s are still quite easy to find and are available from distributors such as Radio Electric Supply (vacuumtubes.net) or Antique Electronic Supply (tubesandmore.com).

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!

METASONIX

495 N. Main #109, LAKEPORT CA 95453 USA
synth@metasonix.com, www.metasonix.com