

# Real Ring Modulator

for music synthesizers.



**Please note: This is not a guitar effect where you can "plug in your guitar and get a sound out". Extra circuitry is absolutely essential, either directly wired, or as parts of other equipment. If you need to ask how to use it, then it's not for you.**

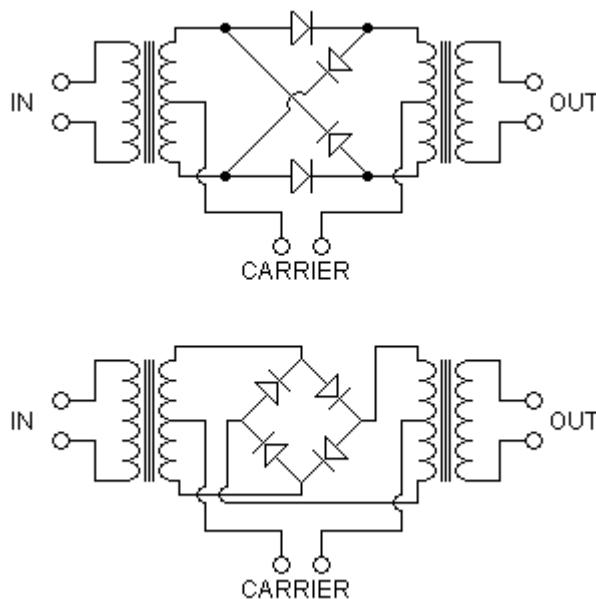
Four quadrant multipliers have more or less replaced ring modulators in synthesizers, even though they still bear the label "ring modulator". The distortion in these is lower than that of a true diode ring modulator, because the diode voltage drops have been eliminated. This leads to better specifications, though in a noise maker, this is not always desirable.

For years I have been building various four quadrant modulators, and have been satisfied with none of them. Not one of them had the raw sonic beauty of the traditional ring modulators I made when I was first starting out in synthesizer building.

For that reason I present here the "Real Ring Modulator", a traditional diode and transformer ring modulator.

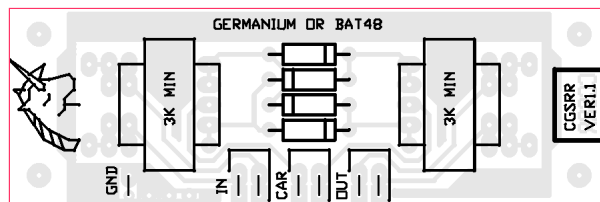
The pre-assembled units were hand assembled using matched germanium diodes and a pair of brand new 3k impedance transformers. Some RRM's used diodes from a computer from 1969. The pre-assembled have been discontinued.

Carrier suppression is good, but not complete, so a compressor-expander could help if better suppression is required.

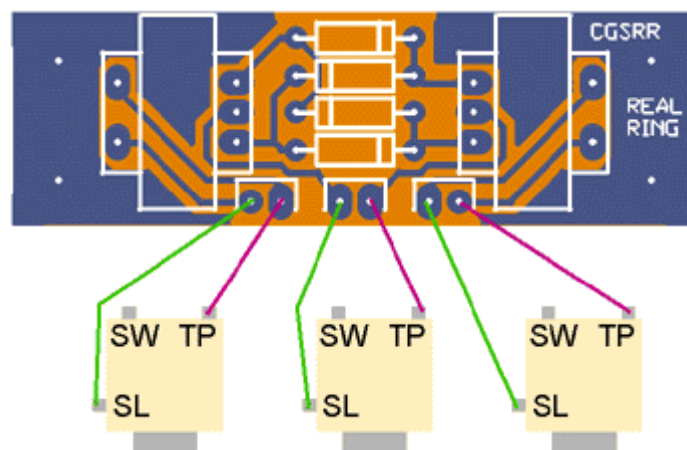


The schematic of Real Ring Modulator. Above is the standard diagram used for a ring modulator, if for no other reason than it is easier to work out what is going on by looking at it. Below the diode ring has been "unfolded" to make it clear that it is a diode ring, not a diode bridge.

## Construction



The component overlay for the VER2.1 PCB. [Click here for an enlarged, printable version. Print at 300dpi.](#)



Wiring the ring modulator. The center input is the carrier input. In and out are interchangeable. The wiring remains the same for the later version of the PCB.

For the pre-assembled version, the only "assembly" needed is to connect the board to input and output jacks.

## Parts list.

- Transformers:  
[Mouser](#) 42TM018-RC 10KCT-10KCT  
[Altronics in Australia.](#) M0222 3kCT - 3k

- Diodes: 1N60 or 1N34A, or any other germanium diode. It is best if they are matched for voltage drop. Schottky signal diodes could also be used, e.g. BAT48.

It is best to use a transformer with an impedance of 3k or greater, though lower impedance coils will work. Note that the DC resistance of the coils is much lower than the specified impedance. If the transformer you buy has both coils center tapped, just ignore or cut off the center tap wire on one coil.

To match diodes, measure the voltage drop across the forward biased diode junction using the diode-test function of any good digital multi-meter. Pick diodes that have readings that are as close as possible to each other. The greater the number of diodes you have to hand, the greater your chance of getting a well matched set.

**Important!** The diode voltage drop is affected by temperature. You must measure all of your diodes in one session, and you must not handle them with your fingers during the process. It is easiest to measure them while they are still on the tape on which they are usually supplied. Stick that to a piece of paper, and write the voltage down beside each as you measure them.

The V1.1 PCB has pads for a greater range of transformer footprints.

#### Notes:

- **Early PCB info:** 0.6" x 2.3" with 3mm mounting holes 0.15" in from the corners.
- **V1.1 PCB info:** 1.0" x 3.0" with 3mm mounting holes 0.15" in from the corners.
- Please [email me](#) if you find any errors.
- The KT-211P transformers used in one of the photographs were junk-box transformers I had to hand. They have a lower impedance than recommended.

If anyone is interested in buying these PCBs, please. Check the [PCBs for Sale](#) page to see if I have any in stock.

Can't find the parts? See the [parts FAQ](#) to see if I've already answered the question. Also see the [CGS Synth discussion group](#).

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