

Mutantes Fuzz--Brazil

Distorter R-VIII by Claudio Cesar Dias Baptista

"This is the 8th of a few distorters built and perfected by me, especially projected for Os Mutantes, since the beginning of his carrer. As the other seven (were)built, they were tested in professional use, by the Mutantes, being the one responsible for the guitar sound of my brother Sergio in almost all the albums recorded by Os Mutantes."

- 3rd module of the synth
- improves the phaser sound

Approximately since the time of the biggest sucesses of (the)"Ventures", previous to the Beatles and first "school" of Mutantes, the guitar sound, purposally distorted, was in almost all north-american songs "for listen and dance". Since then, the distortion in the guitar sound started to be subject of home researches, where guitarists and technicians searched for the distortion sound that more pleased them.

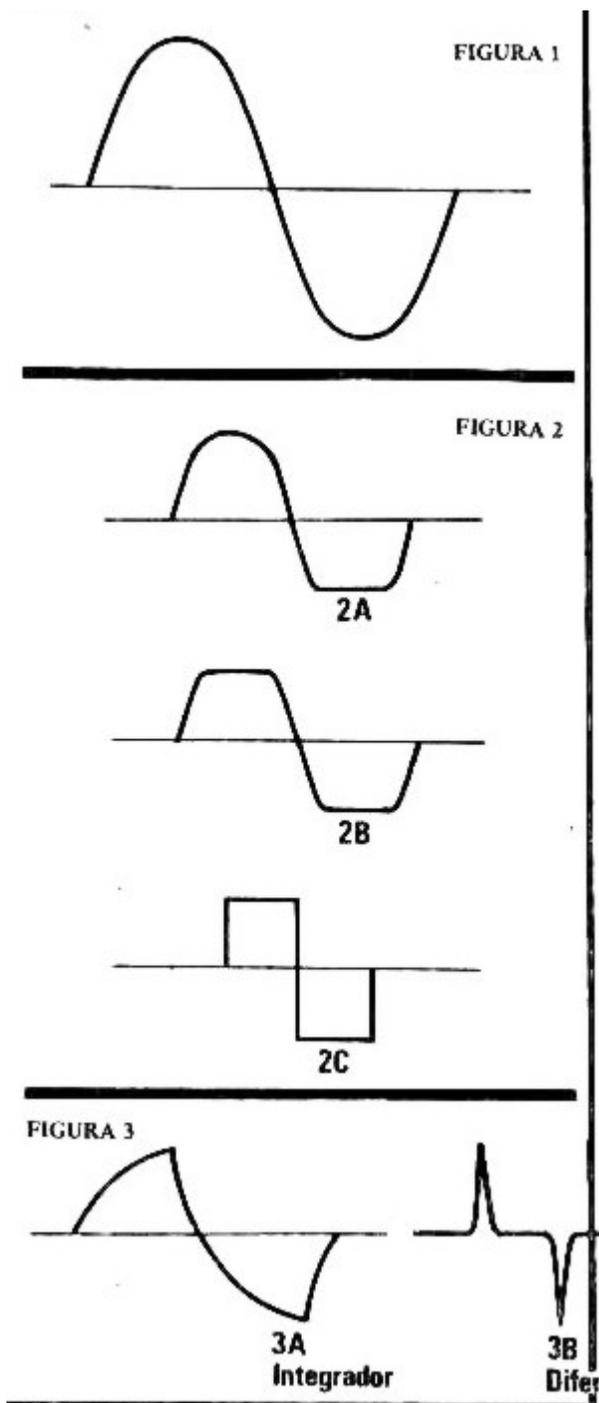
The distorter was seen by almost all the sound technicians as a curse, because it's objective was exactly the inverse of the biggest objective of the technicians. How much discussions we faced, me and Os Mutantes, from the (record)labels and everywhere. "We use the distortion or we don't record the album." This quote was used in the recording sessions of the first album. We won, and the album was recorded with distortion. This happened with the first distortion of the series that I built, and got the final version with this one in the article. The technician was a little right. My first distorter had radio frequency noise that harmed the recordings. Today the distorters are free from this problem.

But, what is, exactly, a distorter? The distorter is a gadget used to modify the sound of, mainly, a electric guitar, being useful for any electric instrument.

The main modification is in the sound timbre, it extend the harmonic content of this sound. This means, in the practice, that it transform the "pure" sound of a guitar in a "vibey" sound, richer, sounding more like a violin than a guitar. The second most important modification is in it's sustain, which gives (to) the guitarist more versatily when he plays. Technically, it also modifies the "dynamic envelope" of a sound.

KINDS OF DISTORTION

Basically, there are two kinds of distortion, the "Fuzz" and the "Overdrive". There are the "distorters-oscillators" and others too, but I won't talk about them now. The "Fuzz" was made in an attempt to reproduce the distorted sound of a tube amp at high levels of volume. To get the "Fuzz", we brutally preamplified the guitar sound, then threw it into a transistor, at a level above the limit of the transistor for a linear reproduction.



The signal, which originally would be like in **the image 1**, will output after the transistor as in the **image 2A** or **image 2B**. The compression in the wave forms in the image **2A and 2B** produces the harmonics. To get more compression and a symmetrical sound, we just need to use a system which the "heart" is made of two diodes. Now we get the square wave form, like in the **image 2C**. All this wave forms are highly compressed to get a "clean" sound, but rich in harmonics. The "Fuzz" name is given to the distorters that produce this kind of compression.

With filters in the output of the distorter, we can mod the wave form, "integrating" or "differentiating", like in the **images 3A and 3B**. The sound of the **image 3A** have more bass, and can be done using capacitors to ground; the sound of the **image 3B** has more treble, and can be done using capacitors in series in the output. The "dirt" in the sound is very usefull in some applications, like in solos. The filters in the output don't solve the "dirt" problem (when it is a problem). We can, using filters in the input of the distorter, get a cleaner sound, but the sound looses some bass, gets more treble and looses some sustain. When we apply the limit(er), we can get cleaner sound with another kind of distorter (the "overdrive") or using a pickup and a Fuzz for each string of the guitar, with six distorters in a guitar. Almost all the guitars that I built for my friends and bothers have six fuzzes, & a pickup for each string, the common pickups and the "holy pickup", which I will talk more about it later.

Getting back to Earth...

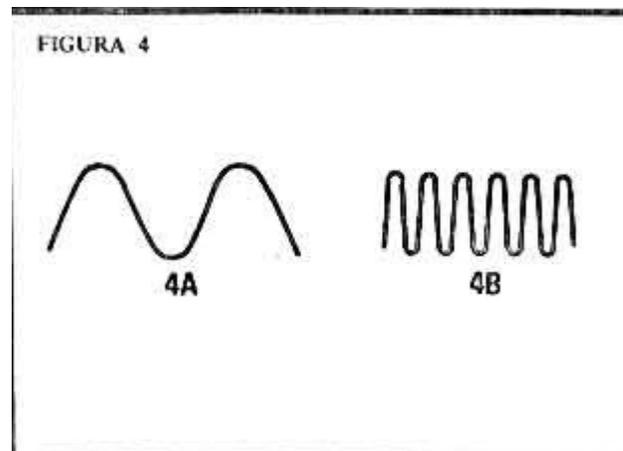
The "Overdriver" is a mid term between the Fuzz and the Sustainer, because it gives sustain and distorts (less than the Fuzz) the sound. A good Overdrive needs lot of research, that can be a few weeks, and sometimes more (than some weeks). This distorter is not a "overdriver" and it is not interesting to be one yet. As a basic distorter, the Fuzz is more versatile and usefull than the overdrive. This is a fuzz, but it is not (just) "a" fuzz. This is "the" fuzz. The "R-VIII".

THE DISTORTER "R-VIII"

The "R-VIII" produces the fuzz sound with lots of sustain, and can enter into feedback easily (with the sound of the amp being caught by the guitar pickups).

MAIN FEATURES

- strong and clean timbre in all the strings
- lots of sustain
- picking sensible(sensitive)
- noiseless, if you follow the build as in this article
- can be used with chords
- can improve the phaser sound
- can be used in the synth or as a indeependent effect



SECRET:

TO TAKE OFF THE INTERMODULATION OF TWO OR MORE STRINGS IN THE FUZZ

The intermodulation produced when you play two or more strings in the same time in a fuzz is produced (by)overlapping the signal of a lower(in pitch) sound, image 4A, with a higher(in pitch) sound, **image 4B**, getting the signal of the **image 4C** that, after the use of the distorter, became the **image 4D**, losing a little treble and creating a modulated sound, that can be usefull sometimes, but almost eveytime, it is not what we want.

To solve the problem, as simply as possible, we need to put a capacitor in series in the input of the distorter, between the guitar and the distorter. The exact value depends more of the practice experience with sound than maths. In our R-VII, this capacitor can be turned off using a switch, then you will have a modulated sound and a cleaner sound when you want.

When we use the capacitor, we get the **image 4E** wave form. The frequency response before the compression, with and without, using the capacitor can be seen in **image 5**.

The maximum input signal before the wave starts to become round, in 6kHz, is 80uV.

The output signal became round when we inject 250uV in the input, in 6kHz.

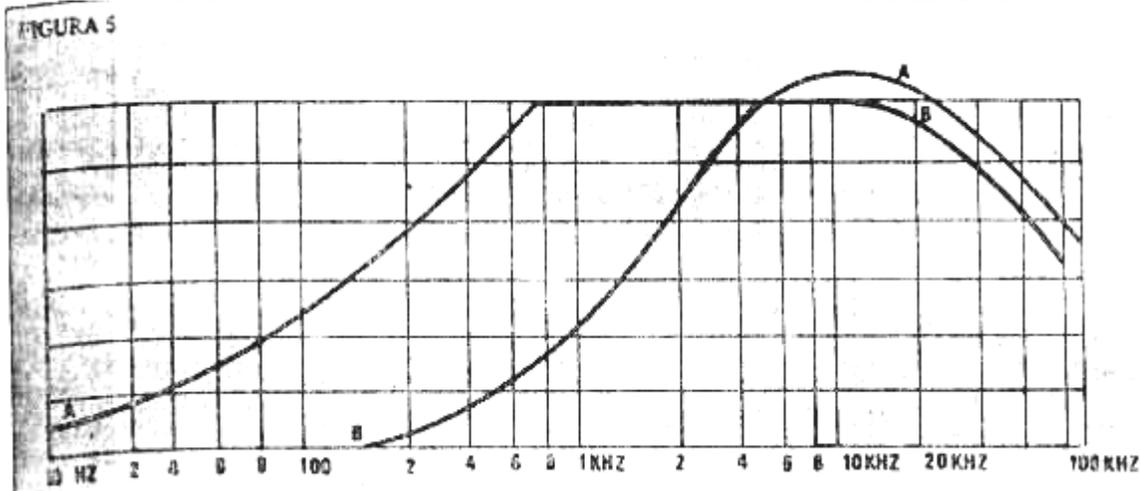
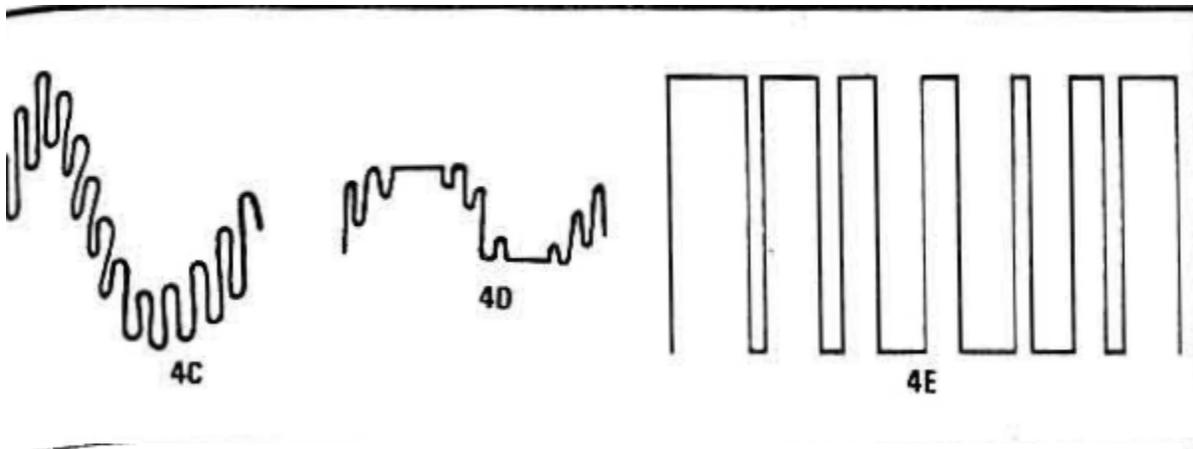
With 3mV in the input, in 6kHz, there is compression in the upper part of the wave.

With 70uV in the input, the signal is compressed symmetrically, always in 6kHz.

With 100mV in the input, the signal is more compressed in the lower part of the wave than the upper part of the wave.

With 600mV in the input, be careful. You can kill the R-VIII.

The output is always 80mV.



BUILDING

As in the Sustainer, published in another article, you need to choose what kind of circuit you want to build. If you want only the Fuzz, build it as in this article. If you are building the whole synth, you will need a preamp, which is the same used in the Phaser circuit (published in another article).

The PCB and layout of the circuit are the **images 11 and 12**.

The input is the point A, and the output is the point C.

POWER SUPPLY

If you build only the Fuzz, you can use a 9V battery for the power supply. If you build the Fuzz with the preamp, you will need a +10V and -10V regulated power supply.

NOISE

If you use batteries or a well regulated power supply, the noise level will be very low.

As a high gain circuit, the R-VIII can capture noise from the wires, jacks, plugs and from the guitar. The suggestions that I wrote for the Sustainer about wiring and shielding should be used here too.

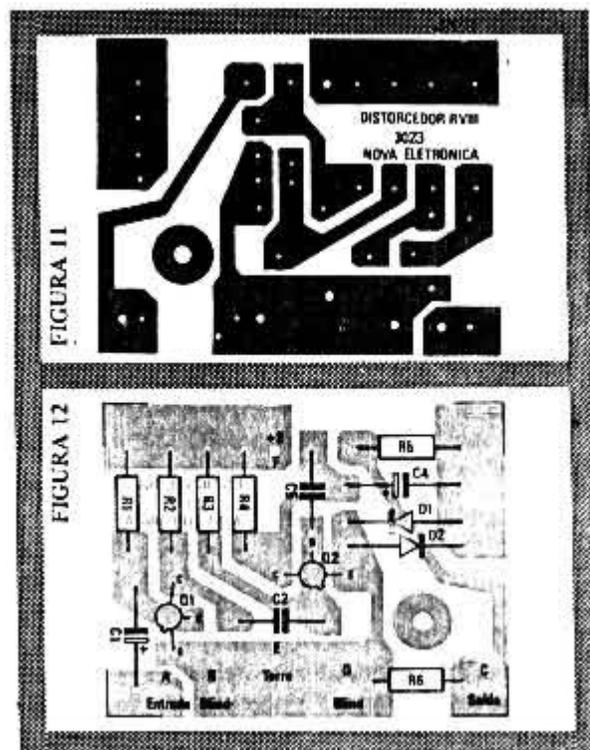
Any kind of guitar will work with the R-VIII, but shielded guitars have less noise. Use a short input cable or, if you are using only the fuzz, you can build it inside of the guitar. Don't connect the input ground to output ground (ground loop). Connect the enclosure to ground only at the input jack to avoid noise and oscillations.

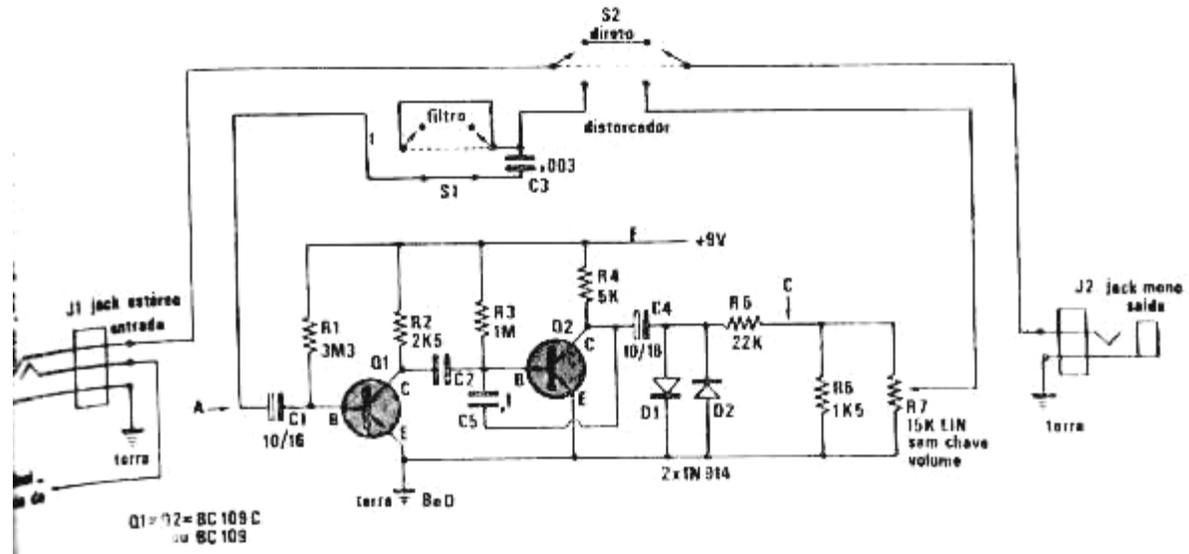
CALIBRATION OF THE CIRCUIT

You don't need to do anything to this circuit. Just plug it and it should work. Just be careful when you solder the input jack. Some people had problems with other builds, when they soldered the wrong lugs of the jack.

HOW IT WORKS

Take a look in the **image 13** (schematic). When you connect a plug to the input jack, the negative pole of the battery is connected to ground, powering the circuit. The signal from the guitar goes to the S2 switch, which is responsible for the bypass. When the circuit is on, the signal goes to S1, which connects or disconnects C3 to the circuit, then the signal goes to C1 and then to the Q1 base. Q1 amplifies the signal and distorts it a little, then signal goes to Q2. The signal is amplified again in Q2, and gets more distorted. Then the signal goes to D1 and D2, which compress the distorted signal. After D1 and D2, the signal goes to R7, which controls the output volume.



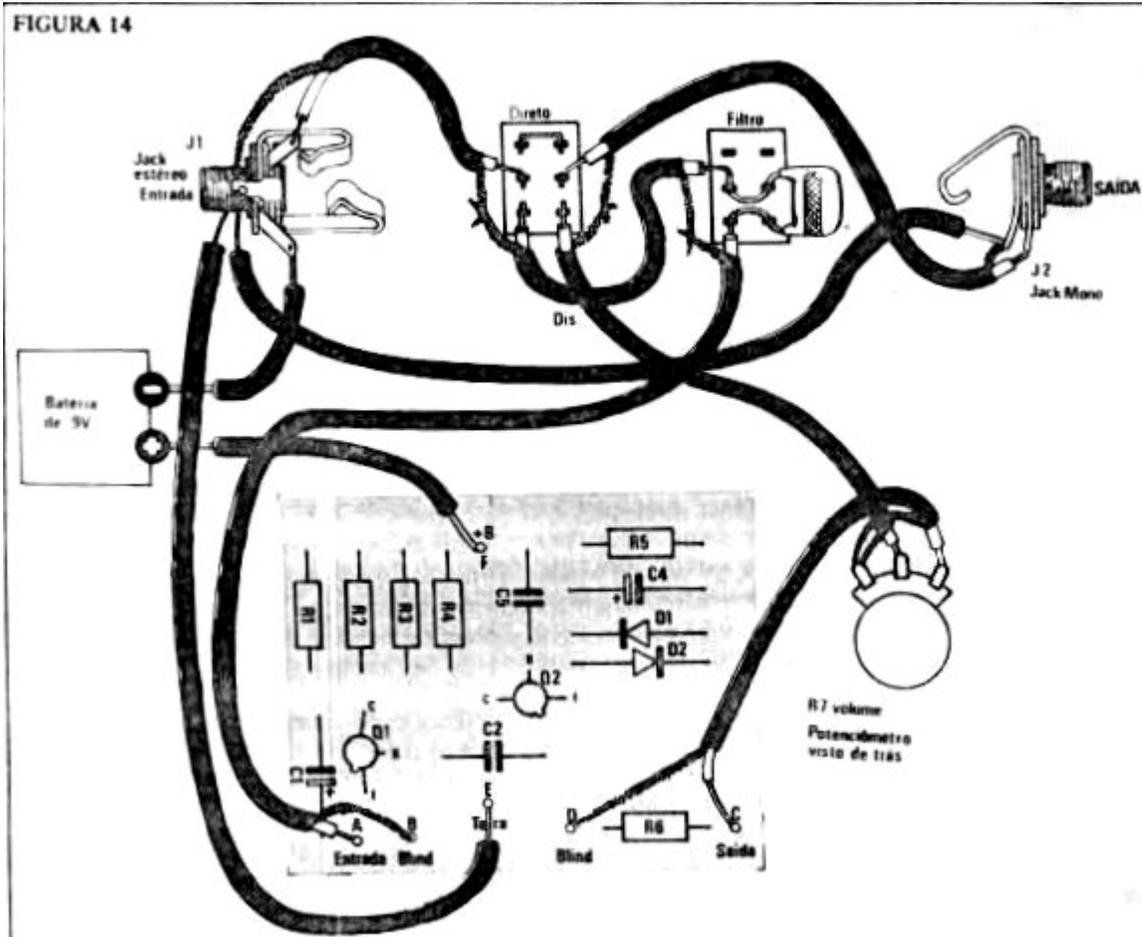


FINISHING AND SHIELDING

The complete built is shown in [the image 14](#). Follow carefully the image so you don't have any problems. The R-VIII should be enclosed in a metal box, or it will pick up external noises.

ABOUT THE NAME

Maybe you are curious about the R in the name of this fuzz. The VIII is easy to get, it's because of this circuit the 8th of the fuzzes that I designed and built for my brothers. The R came from Regulus, which was the brand that I used when I built instruments and circuits. As the R-VIII was designed when I still built them, the R was used in it's name.



MODS

Here are some suggestions to mod the circuit. I tried all of them and they work, but you can improve them in your build.

1-ATTACK

Take off C5 from the circuit and put the circuit in the image 15A in it's place.

2-FILTER

Connect the circuit in the image 15B to the output C of the circuit.

3-LIMITER

This is the most interesting suggestion, because it plays with the wave form, turning the sound similar to some overdrives and YES sound. It's not perfect, but the R-VIII became more versatile. Basically, you will slowly connect the diodes in the circuit. Take a look in the image 15C.

THE MODS IMAGES ARE HARD TO SEE, BUT THE LIMITER MOD, WHICH IS THE MOST INTERESTING MOD, IS JUST A POT BETWEEN THE OUTPUT AND THE DIODES. NOW THIS DOESN'T SOUND (like)AS SOMETHING NEW, BUT THIS ARTICLE WAS WRITTEN IN THE 70's I BELIEVE. THIS SHOWS A LITTLE HOW CLAUDIO IS A GENIeUS AND HOW HE USED THINGS THAT WE ARE USING NOW, BUT LOTS OF YEARS BEFORE.

NOTES:

[translation by Marcos](#)

[MSWord/PDF document by TonyB](#)

