



CASS MOD



Disclaimer: If you're going to attempt to prepare/modify/circuit bend/disassemble any electronic device, be aware that you are at risk of serious injury with the device itself or the tools you may use; electronic devices may be irreversibly damaged or destroyed (all warranties will be void); if any loss of property or injury occurs, it will be solely your responsibility.

ChatGPT Translate:

This tutorial is for making some modifications to a Walkman-type cassette player that is quite popular on Aliexpress or Amazon. The most interesting modification is to modify the speed control, and the best option is to readjust, replace, or manipulate the adjustment trimmer that all players have. This trimmer is used in the factory to calibrate the playback speed, which is normally set at 47.6mm/s.

So let's do some circuit bending! The idea is to replace the trimmer with an external potentiometer that allows us to easily vary the speed (a trimmer and a potentiometer are essentially the same thing with a different shape).

We will also modify the audio section to obtain a voltage control* that allows us to modulate (vary) the audio output. To do this, we will use vactrols, as it is the simplest and easiest way to understand and make for everyone. We will also add a vactrol to the speed potentiometer to be able to change the speed, "tone," externally with CV. This is not intended to be an advanced mod, but for all audiences. With useful and well-adjusted functions (everything that basic components allow us to use). Don't expect a perfect or linear response, but it will be sufficient to experiment and achieve very good effects that would be impossible otherwise.

Vactrol

A vactrol can be commercial or DIY, and personally, I like the DIY ones because they allow me to use the most suitable components in each case or the ones that are easier to access. There should be a small tutorial along with this one on how to make them, or if not, on my website. All the ones I'm going to use here use a white LED with a resistance that limits consumption to a few mA (milliamps). If you use a different color, you may need to adjust the Rled resistors.

CV (control voltage) is used to adjust different parameters with external devices such as a Eurorack synth, an Arturia Beatstep, a Korg SQ-1, or any compatible DIY machine. Normally, the ranges are from 0 to 5V or 0 to 10V, or even -5V to +5V.

let's get started!



There are different versions of the same walkmans that I'm going to use, the color of the casing and/or the electronics may differ.

In my case, the casing is very similar, the mechanics are the same, but the electronics are very different...

So let's take a look at two examples that I have named Walkman 1 and Walkman 2 with different electronics.



Walkman 1) Stereo with the possibility of digitizing the tape audio by connecting it to a PC.

- Stereo head, double for autoreverse.
- IC: LAG 668, which includes:
 - Motor control.
 - Preamp and final amplifier.
 - Motor noise elimination in the audio output.
 - Voltage-controlled attenuators! :-)
- Bass boost... although this walkman doesn't use it.



Walkman 2) "fake stereo" with the possibility of digitizing the tape audio by connecting it to a PC.

- Mono head, double for autoreverse.
- IC: AN6650 to control the cassette motor.
- Single-channel preamplifier circuit with two transistors.
- Output stage with an inverting op-amp.
- Stereo headphone output jack.



Yes, Walkman 2 is MONO! with a stereo output jack or rather "fake stereo" since it sounds the same on each output channel. The audio quality is more lo-fi. And if you use it to digitize tapes, you will get a mono digitization! The price is also lower.

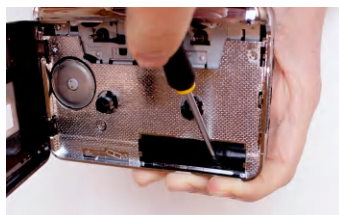
I will only talk about the two that I have modified, the mono and the ST. The electronics in other colors of casing should be very similar to these two. I have seen a transparent one with a black PCB that seems to be like the ST electronics.

DISASSEMBLE! (valid for the mono and ST)

1) To remove the Walkman's casing: unscrew the 3 small screws on the sides.



2) Open the battery compartment and use a screwdriver to push the black plastic part below the tab inside, so it disengages from the top part, which is usually silver. At the same time, use your other hand to force the black and silver parts apart.



Keep separating the two parts, you'll notice that where the jack and volume controls are, they won't come apart easily. So you'll need to gently pry them apart with a screwdriver while pulling the two halves apart.



Separate both parts, as seen in the photos, with the black cover facing up and the rest facing down.



Walkman 1 Stereo

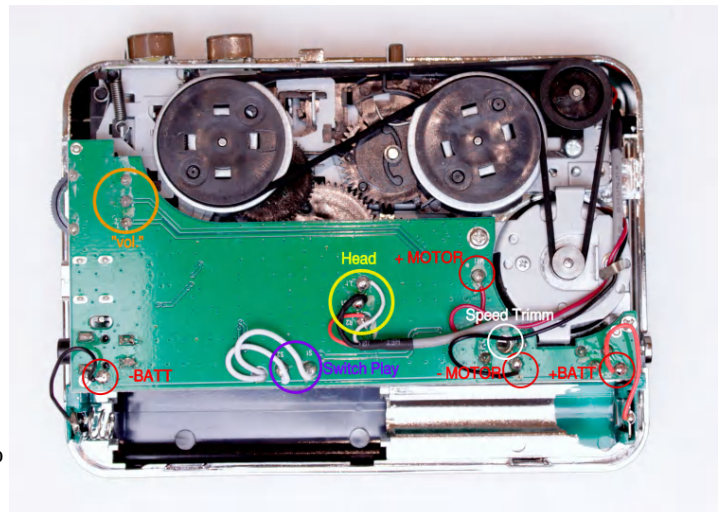
List of necessary components:

- 10k and 1M linear potentiometers
- Two 3.5mm jacks
- Resistors:
 - R13 = 7.5k
 - Rmin = 12k
 - Rled = 4.7k x2

There are so few components that we won't be using a PCB. It's not worth it. We'll simplify things and make it as easy as possible.

Interesting PCB connections.

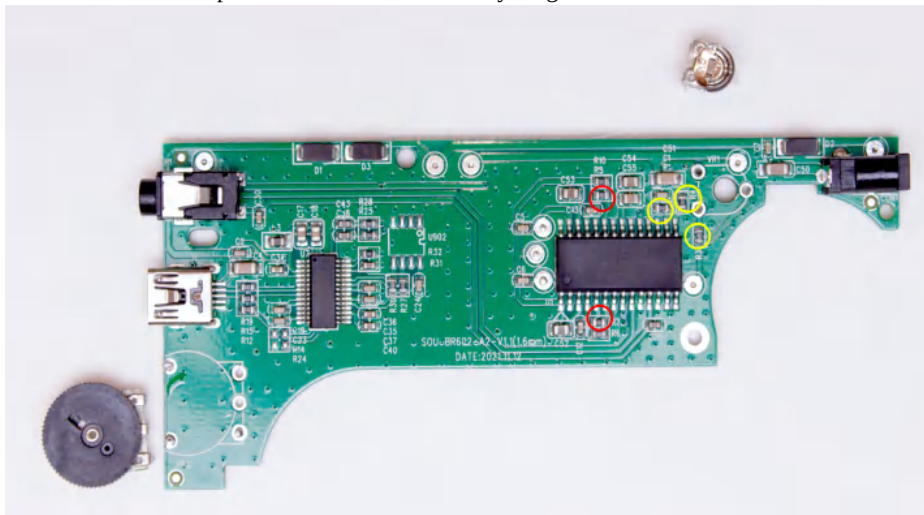
At this point, we could connect the modifications, but sometimes the factory components "interfere" with the modifications and limit us. So, it's ideal to remove the PCB to change or remove some components.



1. Desolder all points with cables marked in the image and remove the two screws that fix the PCB. There are only two, and they are in plain sight.

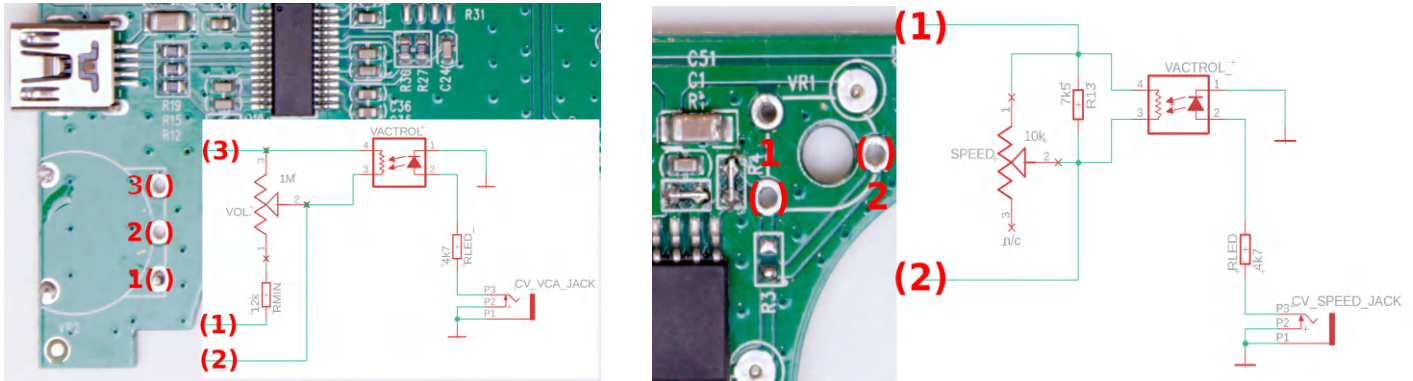
2. We're going to desolder the volume potentiometer and speed trimmer. Then, we'll solder some wires in their place that will go towards the modifications on the outside of the walkman.

2.1. We will no longer need resistors R3, R4, and R1 (marked in yellow in the image below), so locate and desolder them. Solder a bridge to R4 and another to R1. Leave the spot where R3 was without anything.



2.2. OPTIONAL, while we're at it, we can take the opportunity to tinker a bit with the bass boost filter, which in this case seems to be very flat. You can see more information in the datasheet of the lag668, attached, to experiment and even make an external control. Here I only propose to increase the bass a bit by replacing the resistors marked in red, which are 15k, with resistors of 12k or 10k.

2.3. The modifications must be connected as shown in the images, resistors bridged, R3 removed, and the connections as they are:



GND del walkman NO se debe conectar con GND de las modificaciones!!

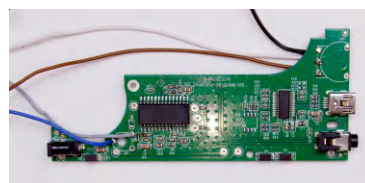
Note that the R3 resistor we removed from the PCB is now replaced by R13 in the schematic, so that 4.7k resistor can be soldered in the empty space of R3 in SMD. However, it is advisable to place it in the external mod box for possible adjustments.

If you have difficulty interpreting the schematics, it will be easier to see later when assembling the components in the external box.

You can play around with the Rled values to get different responses from the vactrol that respond to different voltages. Use lower values to respond to lower voltages, but be aware that at 5V or more without the RLED resistor, you'll be forcing a white LED and burning a red LED! And at 10V or more, there might be smoke... so there should always be a minimum resistance. Personally, if you don't have enough knowledge about LEDs but want to experiment, I recommend not going below 470 ohms for a blue or white LED and 1k for others...

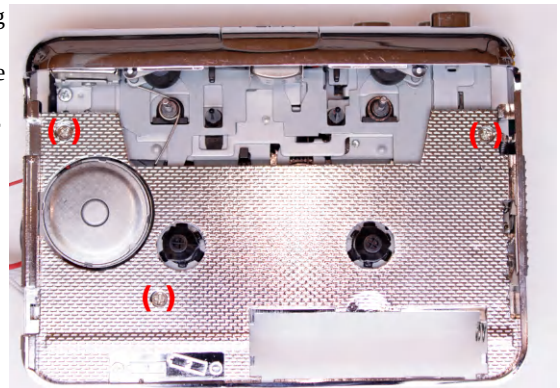
In the case of volume control, it will now always be in the modified box since we removed it from the PCB, but there is the possibility of leaving it on the PCB and not putting the one shown in the schematic that goes to the external mod box. Then you connect terminals (1) and (2) of the LDR to the potentiometer in the same way. The response will not be the same, and you will need to play around with the values.

2.4. Solder two wires to the speed trimmer as shown in the image and three to the volume potentiometer. The rest of the components can go in the external box with the pots, jacks, and more. Then, reassemble the PCB and solder its connections again.

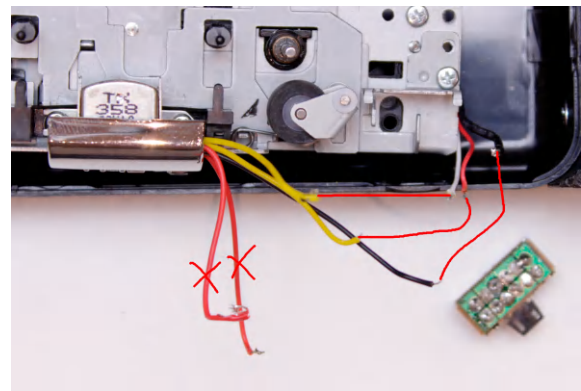
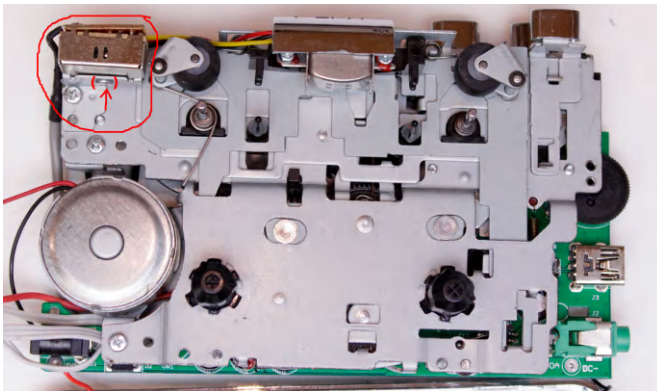


3. Now we can make a final and interesting mod, which consists of removing and taking out the switch that switches the A and B heads in the autoreverse function. Normally, when we are listening to side A and press the autoreverse button, the tape will switch direction and we will listen to side B. But by removing this switch, we will no longer hear side B, but instead we will hear side A, but in reverse! It's like playing a vinyl record in the opposite direction...

3.1 Remove the screws marked in the image on the right, and then separate the plastic casing from the mechanism.



3.2 Locate the switch and remove the screw indicated in the image below, then connect the cables as follows:



We have two red wires, two yellow wires, and one black wire coming from the head, and white, red, and black wires going to the PCB. We discard the red wires from the head. We solder the yellow wires from the head to the white and red wires going to the PCB, and then black to black. We insulate the solder joints using heat shrink tubing if desired.

3.3. Assemble the casing and tighten the three screws. The cables may seem like they will rub against the black wheel, but they were like that before. Don't worry, when it runs and the wheel goes down in the opposite direction of the cables, just make sure they're loose and not trapped between any parts or excessively tense.

4. If you have a 3D printer, you can print the box that I use. You will find the .stl file along with this PDF. Or you can use any box you prefer.



4.1 Let's screw the box to the side as follows. And cut out a little bit of the lid to allow the cables to pass through.

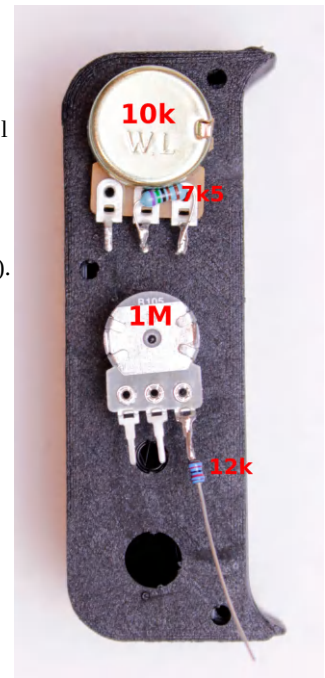


5. Let's go for the panel with the components for the modification.

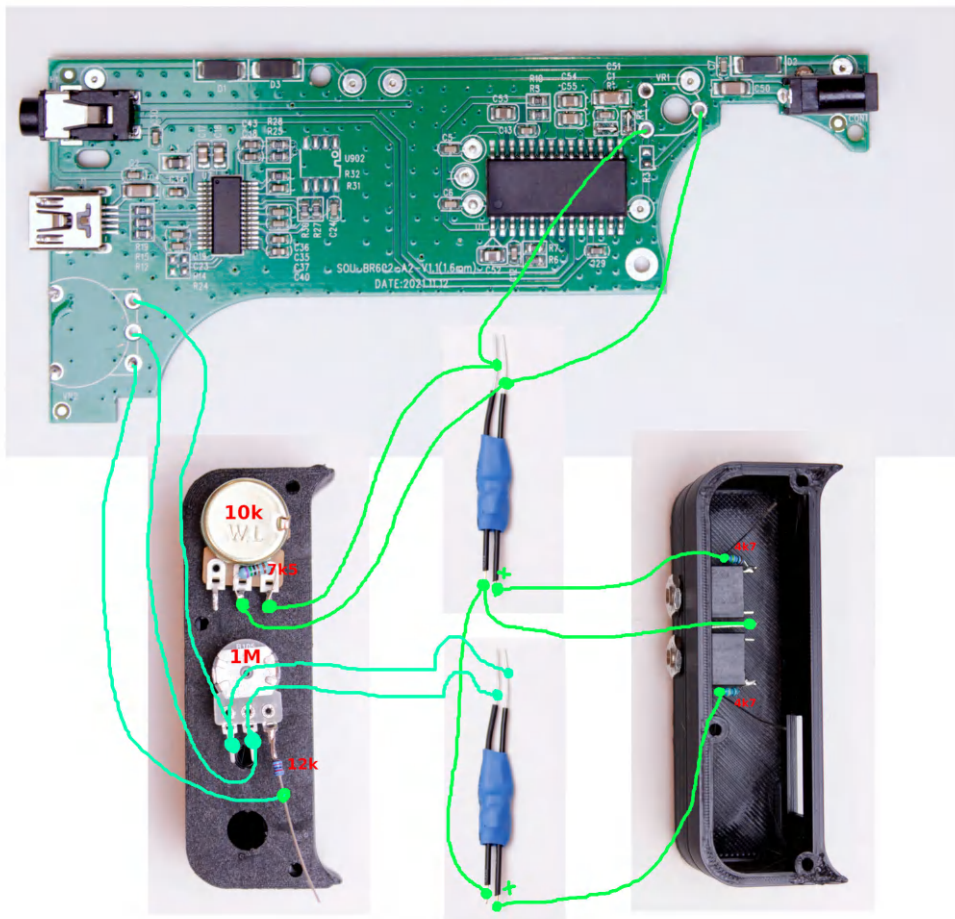
Speed potentiometer above 10k with 7k5 resistance

Volume potentiometer below 1M with 12k on pin 1. It can also be 100k with 1k2, but the vactrol response will be different.

5.1. Solder the vactrols, in my case they are the same and DIY (with white LED, higher voltage). You can see my vactrol tutorial attached. And solder the jacks with their resistors:

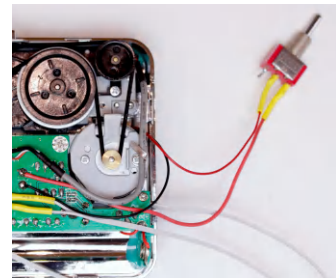
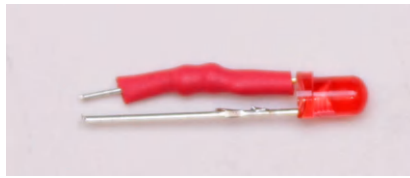
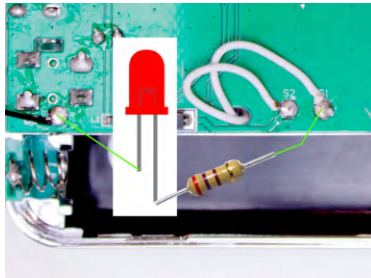


5.2. Solder the wires



5.3. We can add a switch to turn the motor on or off, like a pause button || and include it in the box.

Unsolder the red motor wire, place a switch like in the picture, with long wires to reach the external box. You can also connect an LED with a 270 ohm resistor that will light up when you press the cassette's play button. Solder the resistor to the LED and insulate it with heat shrink tubing and we will put cables long enough to reach the external box. In my box panel, there are holes for the LED and the switch.



The white cables seen in the LED photo would also allow turning on and off the motor, in fact, all the electronics. I have decided to put the switch only on the motor to avoid startup noise, and because if you want to manipulate the mechanism with your hands, you can do it and at the same time listen to the audio output since the electronics continue running. A 3 cm hole in the back below the belt wheels could be interesting for this purpose. ;)

6. Well, this should work perfectly, but if not, review the entire assembly carefully and patiently.

If you power the Walkman at 5V through its USB port instead of using batteries, you'll notice that it sounds louder and the speed response is better!! since it's designed to operate at 5V.

This work is under license.



<https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode>

olitroniklab@gmail.com

[@olitronik_lab](https://www.instagram.com/olitronik_lab)

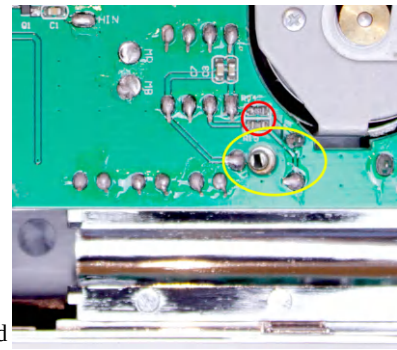
<https://olitroniklab.org/>

Walkman 2 Mono

Component list

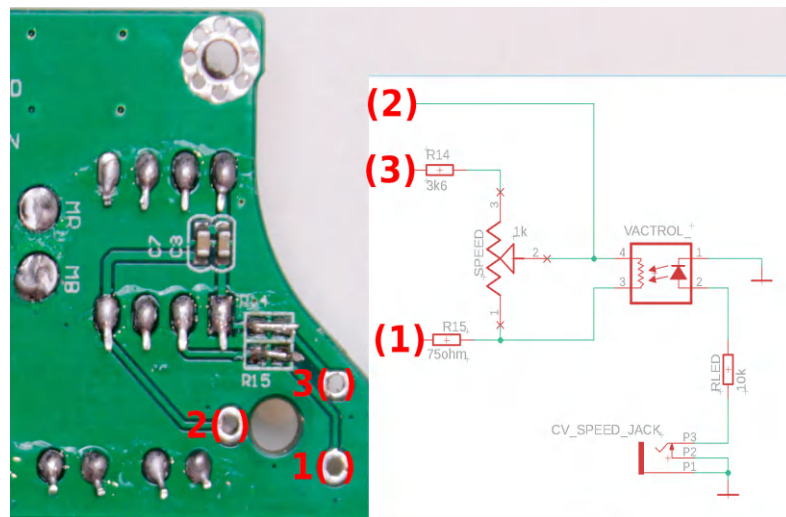
- Speed pot 1k
- CV adjust pot 100k
- R14 3.6k
- R15 75 ohm
- Rled 10k and 1k
- Rmin 15k
- 3.5mm jack x2
- DIY vactrol x2

1) Once the back cover is removed, locate the speed adjustment trimmer, marked in yellow. In my case, I preferred to remove it completely to not depend on it and avoid interference in the mod. The two resistors marked in red will allow you to use different potentiometer values or adjust the potentiometer range as desired.



You can replace them with SMD resistors of the required value or bridge them and place them in the mod box next to the potentiometer. In my case, I opted for the second option with values of 3.6k for R14 and 75 ohms for R15 and a 1k potentiometer, which gives me perfect speed control: potentiometer at minimum stops the motor, and it will accelerate to the maximum with the entire potentiometer range.

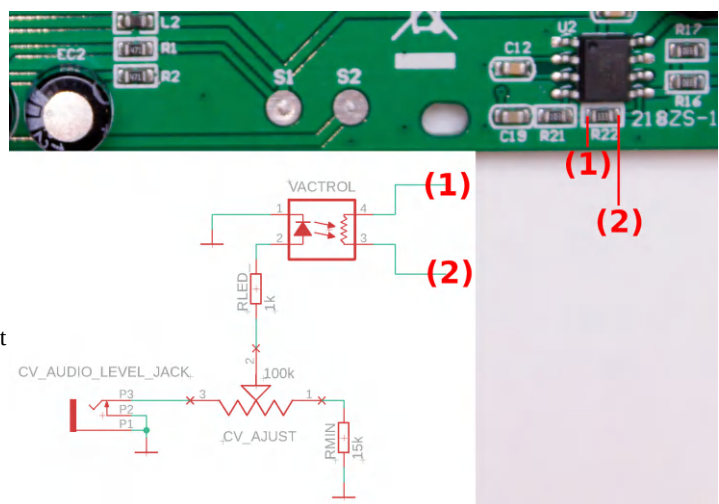
This would look like the following image:



GND del walkman NO se debe conectar con GND de las modificaciones!!

1.1) We will also add a vactrol as seen in the diagram to obtain CV for varying the speed or tone externally. You can play around with the values of Rled to obtain different responses from the vactrol that correspond to different voltages. You can use a trimmer to get the best adjustment, but remember that at 5V or higher without resistance, you will be forcing a white LED and burning a red LED! And at 10V or higher, there may be smoke... so there should always be a minimum resistance. Personally, I recommend not going below 470 ohms for a blue or white LED and 1k for others.

1.2.) Modification to be able to vary the volume with a voltage control. In reality, we vary the gain of the final amplifier, which is not the best way to do it but is the simplest and does not any problem for the cassette. For this, we will use a vactrol along with a potentiometer as an attenuator to adjust the input voltage to the response we need. We will connect it in parallel to R22 as seen in the image, and that's it! As the CV increases, the audio at the output is attenuated.



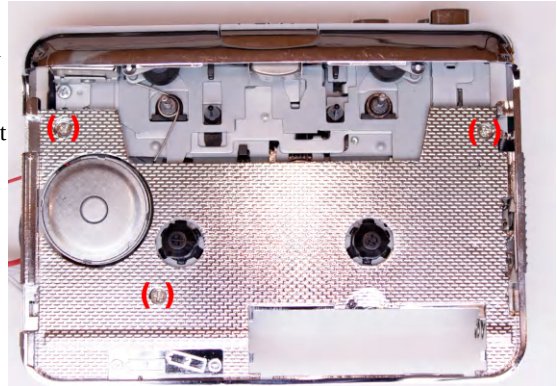
GND del walkman NO se debe conectar con GND de las modificaciones!!

1. OPTIONALLY, we can also replace R22 with a larger one, which will give us more gain, meaning more power at the output that can lead to distortion, **BE CAREFUL AS THIS CAN BE DANGEROUS TO THE EAR.** Keeping the original resistance is a good idea, at most increasing it slightly to 47k. I RECOMMEND KEEPING THE ORIGINAL RESISTANCE TO AVOID PROBLEMS.

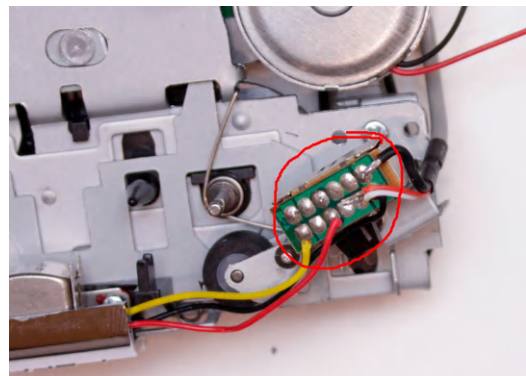
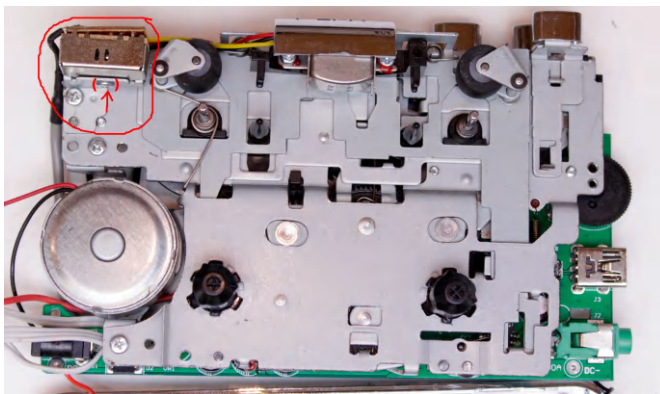
2.1) We will solder some wires to make the connections with the external box that will hold the mod seen in the diagrams. In this case, it is advisable to keep the vactrol inside the walkman so that the connection with R22 is as short as possible and to avoid interference.

3. Before closing the walkman, we can do one last interesting mod, which consists of disassembling and removing the switch that switches the A and B heads in the autoreverse. Normally, if we are listening to side A and press the autoreverse button, the tape will change direction and we will hear side B, but by removing this switch, we will no longer hear side B but instead side A, but in reverse! It's like playing a vinyl record backwards...

3.1 Remove the screws marked in the image on the right, and then separate the plastic part of the mechanism.

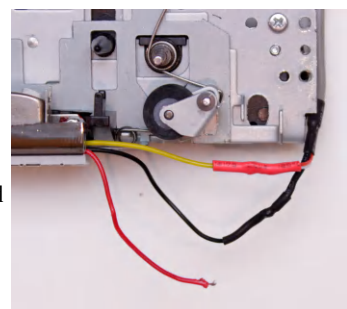


3.2 Locate the switch and remove the screw indicated in the image below, then unsolder all the wires from the switch.



3.3 On one side, we have a red cable, a yellow cable, and a black cable coming from the head. On the other side, we have a shielded gray cable with three cables inside: red, white, and black.

We connect them as shown in the photo, first by soldering and then insulating them, which can be done with heat-shrink tubing. Connect black with black and yellow with red and white (this is because the head and the circuit are mono, although the gray cable is designed for stereo). You can cut and/or isolate the red cable from the head as it will not be used.



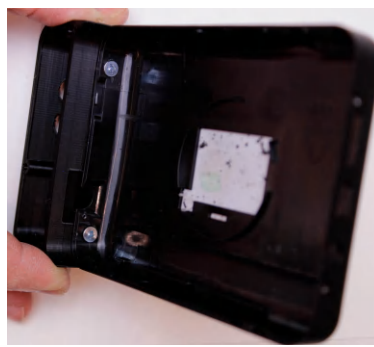
3.4 Install the case and tighten the three screws.

It may seem like the wires are going to rub against the black wheel, but it was like that before, so don't worry. When it's running and the wheel is moving downwards in the opposite direction to the wires, just make sure that they are loose and not caught between any parts or overly tense.

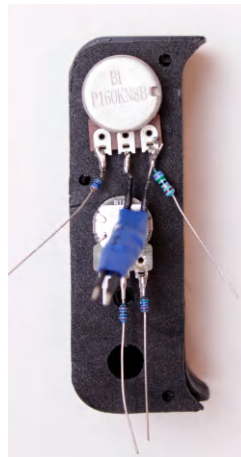
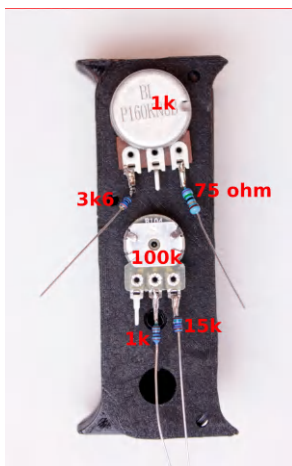
4. If you have a 3D printer, you can print the box that I use. You will find the .stl file along with this pdf. Or you can use any box you prefer.



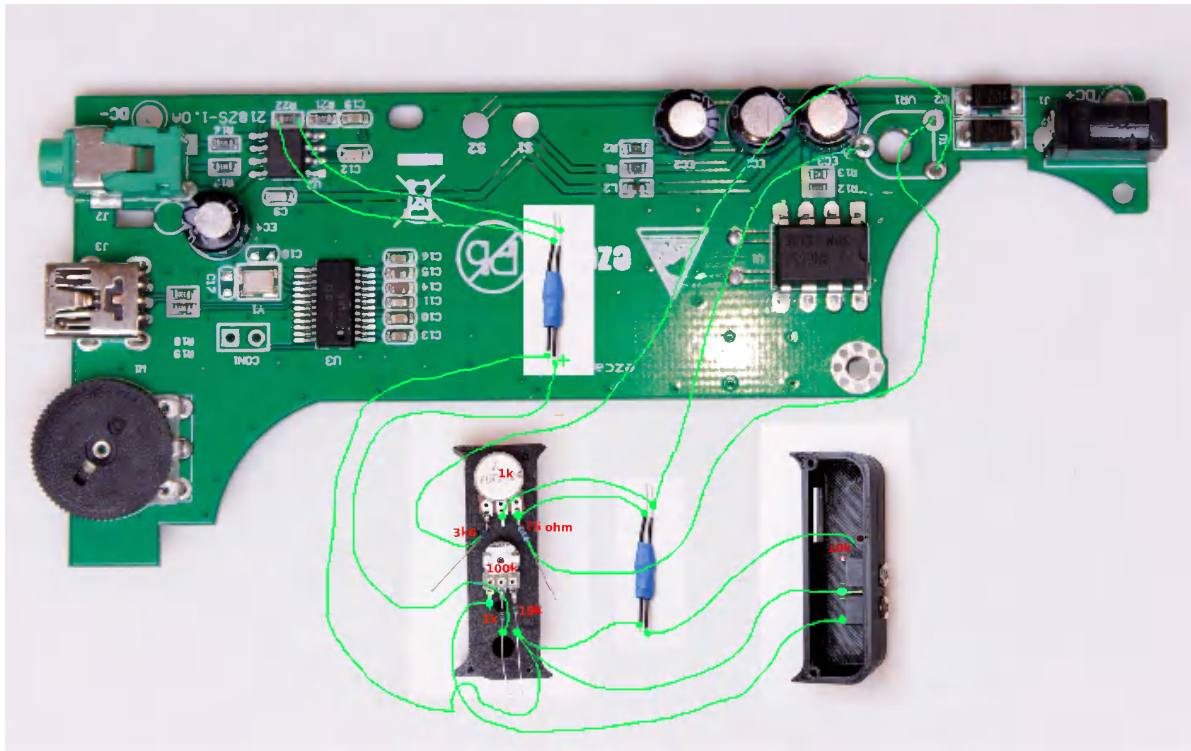
4.1. We are going to screw the box to the side as follows.



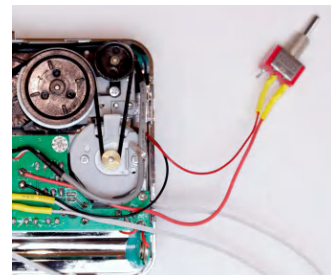
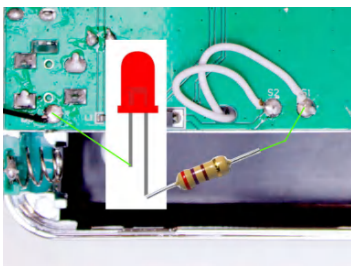
5. Let's move on to the panel with the modification: We solder the resistors as shown in the photo and then the vactrol.



5.1. Now the wires:



5.2. We can add a switch to turn the motor on or off, like a pause button [||], and include it in the box. Cut one of the two wires and add a switch as shown in the image. You can also add a LED with a 270 ohm resistor that will light up when you press the play button on the cassette. Solder the resistor to the LED and insulate it with heat shrink tubing, and make sure the cables are long enough to reach the external box.



The white wires seen in the LED photo would also allow turning on and off the motor, in fact, all the electronics. I have decided to put the switch only on the motor to avoid startup noise, and because if you want to manipulate the mechanism with your hands you can do it while listening to the audio output since the electronics are still running. Optionally, a 3 cm hole in the back under the belt wheels could be useful for this purpose. ;)

6. Alright, this should work perfectly, if not, go through the whole assembly carefully.

If you power the Walkman with 5V through its USB port instead of using batteries, you will notice that it sounds louder and the speed response is better!

This work is licensed.



<https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode>

olitroniklab@gmail.com

[@olitronik_lab](https://www.instagram.com/olitronik_lab)

<https://olitroniklab.org/>

