



Pocket Tootophone

by [Thinkenstein](#) on March 23, 2012

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Author: Thinkenstein [author's website](#)

I'm a refugee from Los Angeles, living in backwoods Puerto Rico for about 35 years now and loving it. I built my own home from discarded nylon fishnet and cement.

Intro: Pocket Tootophone

Music teachers take note: this reed instrument would very likely transform your classroom into a fun place to be, if it is not already. This is probably one of the world's smallest melodic instruments, smaller than a harmonica. With a sliding scale of infinite notes available, and a range of about 3 octaves, the tootophone is very versatile. Its size makes it perfect for carrying in a pocket, ready to practice with whenever inspiration strikes.

There is no fingering to learn. Given a few basic principles, one plays by ear, the way one might whistle melodically, or sing. Just about any melody you can imagine, you can play -- with feeling!

The basic tootophone mouthpiece is a modified hypodermic syringe. It is shaped like a saxophone mouthpiece and uses reeds of different materials, such as x-ray film plastic or silicone rubber. My favorite uses x-ray film with silicone on both sides. A tootophone mouthpiece costs about 15 cents to make; 10 cents for the syringe, plus a little electrical tape, thread, and reed material. One could equip a whole tootophone band for next to nothing. Schools often complain about budget restraints, and regular band instruments are usually expensive. A saxophone can cost thousands of dollars.

This Pocket Tootophone design can be easily reconfigured to play the mouthpiece alone, the mouthpiece and the unit it plugs into, or the mouthpiece, plug-in unit and pipe section that protects the mouthpiece in your pocket. It is three instruments in one! Plus, you can plug the mouthpiece into other separate body variations to further expand the range of voices it can have.

Making a tootophone is not difficult. The student learns shop skills, craftsmanship, and elements of physics related to sound. If something ever happens to the tootophone, the student can always make another at negligible cost. That sort of self-sufficiency is empowering and is good for self-esteem.

Playing the tootophone involves breath control, and a lot of subtle mouth movement. The breath control is useful for playing any wind instrument.

I would like to see international tootophone bands everywhere and people playing together more often. Getting people to play and have fun together is a good way to protest war. Tootophone playing tends to make people smile. Let it be the people's instrument of the 21st century!

Hear sample recordings in the last step.





Step 1: Tools and Materials

I use 1 cc insulin syringes, available at any pharmacy for about 10 cents. Included with the syringe is a plastic cap that covers the plunger. Save the cap. It becomes part of the plug-in unit that holds the mouthpiece to the body. Use pliers to pull out the metal needle. Dispose of the needle tips carefully, as they are very sharp.

You can use mineral spirits, or another solvent to rub the printed marks off the syringe, in an attempt to remove some of the non-music related stigma syringes carry these days. Basically, it's just sterile plastic tubing, but the ink will eventually wear off onto your lips if you don't remove it first. .

You need to sand down the end of the syringe to make the curve the reed presses against. For that, I use coarse, medium, and fine sandpaper. After using the fine sandpaper, I also use some normal paper without abrasive to polish the plastic even more.

I use a finely honed X-acto knife to clean the inside edges of the curve after sanding, and some fine sandpaper to get the burrs off of the outside edges. Flat spots and tiny burrs can interfere with reed movement at a micro-level across the sanded curve, creating jumps in what should be a smooth sliding scale.

To help hold the syringe during sanding, and to protect one's knuckles from the sandpaper, I use a little round stick that jams into the back end of the syringe. I put some rubber tubing on the stick to make it easier to grab onto with my hand.

You can make reeds from plastic trash, like vacuum formed packaging material. I get discarded x-rays from our hospital, wash the images off, and use the beautiful blue plastic material to make my reeds. Sometimes, I put a layer of silicone rubber on one, or both sides of the reed material to mellow out the sound some. For that, you need a soft printmaking roller and some typing paper, along with some clear 100% RTV silicone rubber, which comes in grease gun cartridges at the hardware store. You also need a grease gun for the cartridge. I use a paper cutter for precise cutting of the reed material strips, after making sheets of the bulk material.

To make the plug in units, you need the plunger cap from the syringe, with a hole drilled and carved with the X-acto knife to its maximum diameter. You also need a #9 rubber O-ring, and a 1/2" CPVC connector. CPVC is like PVC plastic, only for hot water, and 1/2" CPVC has a slightly smaller diameter than 1/2" PVC does.

Precise diameters are critical in getting all the parts to fit together perfectly. Sometimes products from different manufacturers are slightly different, and the differences cause problems. For example, the press fit of the syringe's plunger cap into the CPVC connector depends on the cap not being able to pass through the center of the connector. It should be stopped half-way by a little ridge inside the connector. If the ridge doesn't protrude enough to the inside, or the cap rim diameter is too small, the cap will not stop where it needs to stop and will pass right through the connector. I am usually lucky, and things work, but if they don't, then look for parts by other manufacturers.

A 3 3/4" piece of 1/2" CPVC pipe serves as the protective sheath, or body extender. I use a file to dress up the outer edges of the cut ends, and the X-acto knife to dress up the inner edges.



Step 2: Shaping the Curve

The curve that you sand in the tip of the mouthpiece is critical to the performance of the tootophone. It is probably the most important step. It needs to have continual curvature, with no flat spots or other defects that might cause glitches in making a smooth sliding scale. By a "sliding scale" I mean a siren-like sound of smooth transition between low and high notes. Within that smooth transition there are an infinite number of note frequencies available. A normal scale of notes is stepped, such as that of a harmonica, and it includes only a limited number of notes.

The reed on the curve of the mouthpiece is like a tangent line in geometry. By pressing the reed with your lips against the curve at different positions, you lengthen or shorten the amount of reed that is able to vibrate. Short lengths weigh less and vibrate faster, creating high notes. Long lengths weigh more, vibrate slower and create low notes. If your reed works at all, it is probably going to be able to get the low notes without any problem. The high notes are more difficult, and problems getting them are often related to curvature problems at the tip of the mouthpiece.

Reed material makes a big difference in the sound of tootophones. Softer reeds get deeper low notes, but can't reach the higher notes that stiffer plastic reeds can get. With soft reed materials, such as solid silicone rubber, I sometimes find an exaggerated curve at the end of the mouthpiece to be useful in getting higher notes. The same curve, used with plastic reeds sometimes creates a hole that the reed can never flex enough to cover completely. Wind passes through without vibrating the reed, so the higher notes are killed completely. Reshaping the tip with a more subtle curve allows the plastic reed to continue vibrating closer to the tip, with a shorter length of reed, giving the higher notes. A soft rubber reed used on that more subtle curve sometimes flaps closed and stays closed, again killing the higher notes. The ideal curvature changes with changes in the reed material.

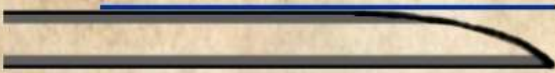
Use the holding stick to keep your hand from making contact with the sandpaper and sanding down your knuckles. Use a forward and backward motion, flexing your wrist some with each stroke for a rocking motion to create the curved surface. If you don't bend your wrist with each stroke, you will sand a flat surface and not a curve. The reed will act more as a one-way flap valve than as a vibrating reed, staying closed and making no sound at all.

The sanded surface of the syringe tubing should be identical on both the left and right sides of the hole. If you look at the mouthpiece from the side and see mismatched curvatures on either side of the central hole, you may be rocking your wrist from side to side as you go forward and backward. Precision comes with practice. If you are really serious about becoming an expert tootophone maker, you will probably make more than just one.

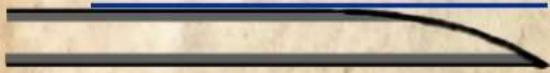
After using the sandpaper (coarse, medium, fine), buff the surfaces using the same hand motion on smooth paper with no abrasive. Then dress up the outside edges with fine sandpaper and the inside edges with the X-acto knife. Use the syringe plunger to push out plastic dust from the inside, and blow it off to get the rest.

SANDING THE CURVE

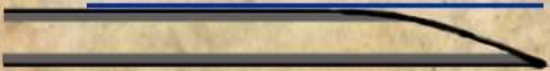
1. Angle at tip is too rounded for stiff plastic to bend and close completely. High notes are lost. You just hear wind. Might work for more flexible rubber reeds.



2. Sharper angle at tip is better for plastic reeds, but rubber reeds might close and stay closed, losing high notes.



3. Avoid too flat curvature at the tip, or the reed will go down and stay down, like a 1-way flap valve.





Step 3: Making the Reed Material

You can use ready-made plastic sheet material from the trash, such as flat areas of vacuum formed packaging material, to make reeds. I prefer x-ray film material that I get from the hospital. I let it soak in water for a few weeks, which loosens the image and lets me rub it off with a sponge. If you don't want to wait for the soaking process, you can use a metallic kitchen scouring pad and elbow grease to get the image off right away.

There is a tinny quality to the sound of all plastic reeds, however, that some people object to. That can be modified by adding a layer of silicone rubber to either, or both sides of the plastic, or by replacing the plastic reed with an all rubber one.

To get a minimum layer of silicone down onto the x-ray film material, I squeeze out some silicone onto the plastic, cover it with a piece of paper, and go over it several times with a soft rubber printmaking roller, pressing as hard as I can, to spread it out. After the silicone hardens, wash the paper fibers off using water and a mild kitchen scouring pad. Repeat the process on the other side for double-sided silicone layer reeds. With the one-sided reeds, I put the silicone layer next to the syringe. The ones with silicone on both sides feel softer, less ticklish to the lips, and have a more mellow sound.

After the sheet material is finished, I cut 1/4" wide strips from it with a paper cutter to make the reeds.

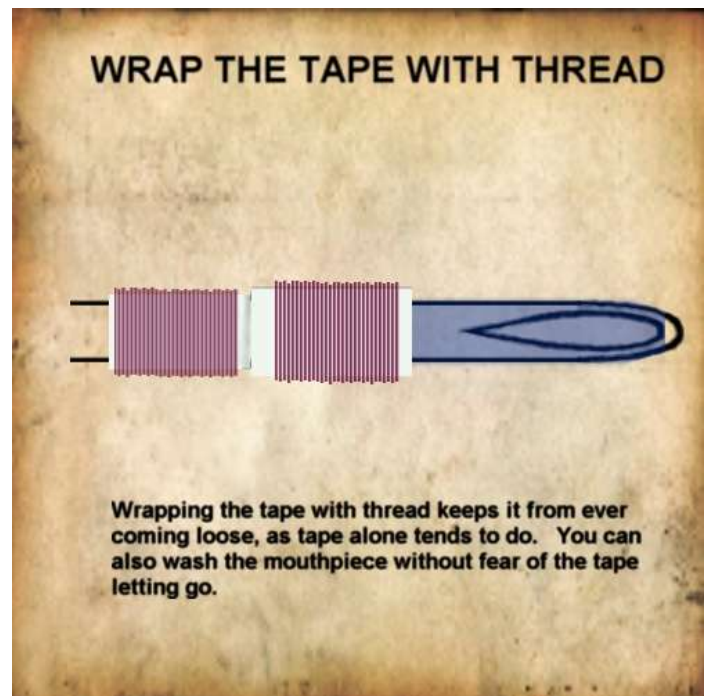
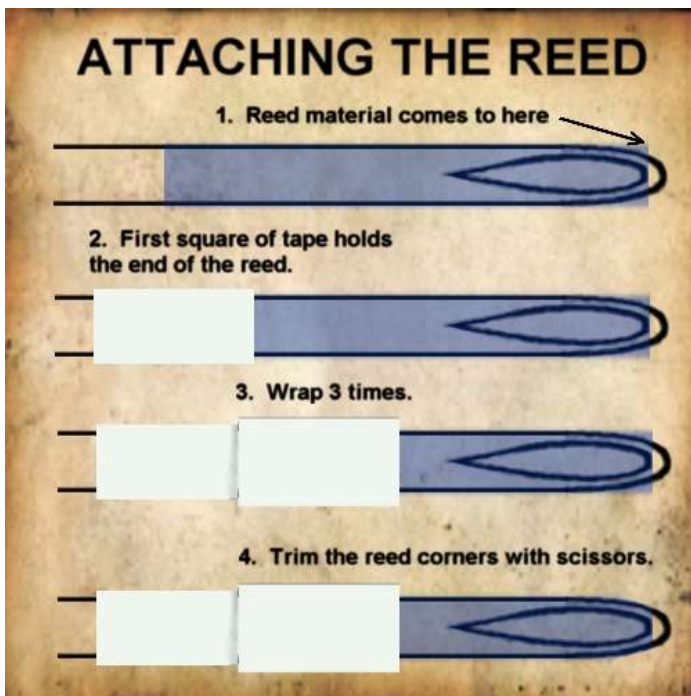
To make solid silicone reeds, I carve a little mold channel into a polyethylene plastic kitchen cutting board I have using a dremel tool. I fill the channel with silicone, cover it with paper, and then something flat and hard like a piece of wood. Lift up the wood, and let the silicone's solvent vapors evaporate through the porous paper. When hard, remove it from the mold and wash off the paper fibers with a soft scouring pad and water.



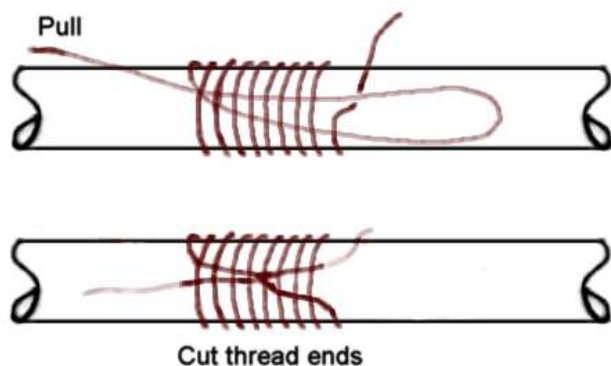
Step 4: Attaching the Reed Material to the Syringe

The reeds are attached using electrical tape (white is my favorite color) and nylon upholstery thread, which also comes in a variety of colors. Test the reed by blowing each step of the way, to make sure it is positioned properly and hasn't shifted. Go for the high notes!

1. Hold the reed in place. The tip of the reed material should come to where the center hole of the syringe ends. It may still work if it is a little too short, or too long, but I find it works best at that location. Take a little square of tape and tape down the end of the reed nearest back end of the mouthpiece. Test it again.
2. Holding the roll of tape in one hand and the mouthpiece in the other, pull the end of the tape down on both sides of the reed in such a way as to firmly hold it where it belongs. If the reed slips to either side, lift up the tape and do it again. When you get the reed centralized, continue wrapping with more tape. I wrap the mouthpiece with three layers of tape to firmly hold the reed while wrapping it with the nylon upholstery thread in the next step. Test it again.
3. At this point, I take tiny scissors and round off the square corners of the reed material where they project past the curved end of the mouthpiece. This removal of a tiny amount of plastic makes the tip of the reed lighter and capable of vibrating faster, extending the high end of the scale some. Test it again.
4. Start wrapping the mouthpiece with the thread. The thread wrapping keeps the tape from ever coming loose, as it tends to do over time, especially when you wash the mouthpiece. I like nylon because it doesn't rot like cotton thread might. This wrapping technique is a little difficult to explain. See the diagram. Basically, you leave some thread tail, make a loop, wrap, and then pass the other end of the thread through the loop. Pull the tail to pull the loose thread in under the wrapping and then trim the excess thread off. There is no knot tying needed. I usually do a second wrapping lower down on the mouthpiece to cover the rest of the tape, that first square at the base of the reed. Sometimes I use colored thread to color code variations in different manufacturing runs. Test again.
7. Cut off the "wings" on either side of the syring, where your fingers give support as you normally push the plunger with your thumb. I use cutting dike pliers and a file. Leave a little bit sticking out to bottom against the plunger cap in the connector unit, but you need to take enough off for the CPVC pipe section to fit over it and into the connector section. Your mouthpiece is now finished.



WINDING THE THREAD



Step 5: The Connector Unit

The connector unit consists of a straight CPVC connector, a #9 rubber O-ring, and the modified plunger cap from the syringe. The only modification needed is a hole in the plunger cap. I drill it on the small side and then enlarge it with an X-acto knife to the maximum size of the inside of the cap. If you leave the hole smaller than that, it will reduce air flow and act as a mute. A mute is sometimes desirable to keep your playing volume down for the benefit of people around you.

After making the hole in the cap, stretch the O-ring over the cap and press both into place using the CPVC pipe that is the protective sheath for the mouthpiece while it is carried in your pocket.

You can remove the protective sheath and use it as a body extension simply by plugging it into the other end of the connector unit.





Step 6: Body variations

These are a few body variations. My favorites are made of recycled x-ray film after washing the image off. The transparent blue jewel color is attractive, and the bodies are very light weight. One can also use the trumpets from old truck horns, or improvise with PVC pipe.

This link takes you to my favorite at the moment, the Jumbo Sax Tootophone: <http://www.instructables.com/id/Jumbo-Sax-Tootophone>

Another favorite is the Tootophone Sax: <http://www.instructables.com/id/Tootophone-Sax-and-Trumpet/>



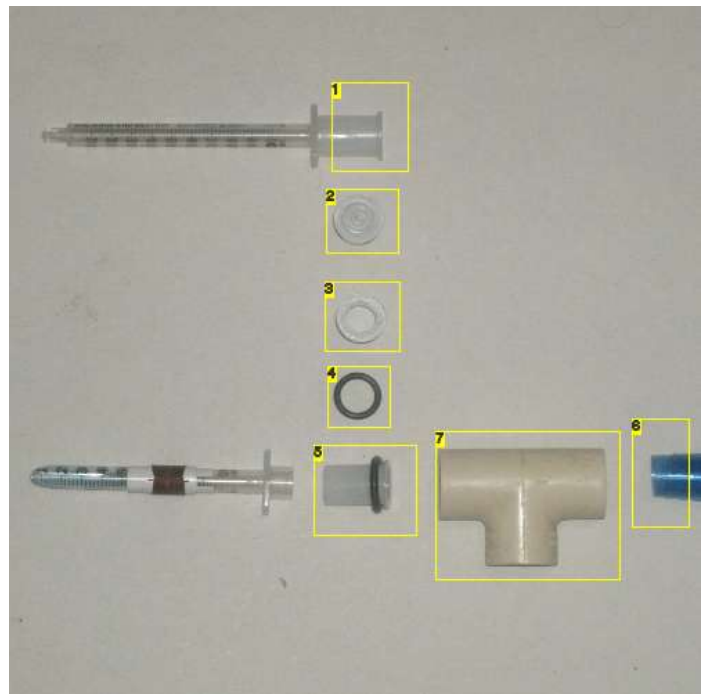
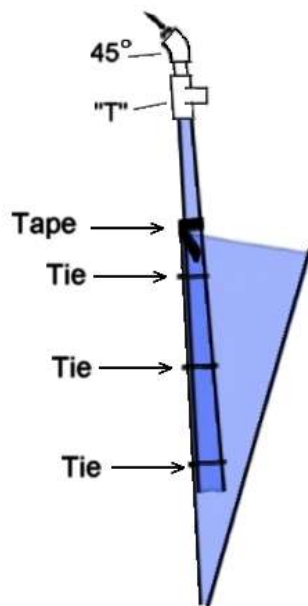


Image Notes

1. This cap holds the plunger inside and keeps the interior of the syringe clean.
2. This is how the end of the cap looks.
3. I drilled a hole and trimmed out the rest of the end with an X-acto knife.
4. Rubber "O" ring
5. Without the "O" ring, the cap fits loosely inside the end of the "T". The "O" ring holds the cap firmly in place, while the tootophone mouthpiece end fits snugly inside the cap.
6. The end of the cone fits inside the "T" with a little clear PVC cement and is then taped.
7. The trumpet model only uses a "T". The sax also uses a 45 degree angle fitting.

Step 7: Playing the Tootophone

The tootophone mouthpiece is light enough that you can hold it in your mouth and play it without any hands. Try it while driving, or riding a bicycle, or gardening, or doing anything else that uses both hands. It helps time pass pleasantly as you build up your playing muscles.

If you put the reed completely in your mouth and blow, you will get the lowest notes. They are the easiest. If you put just the tip into your mouth and blow, you will get higher notes, but moving the mouthpiece in and out of your mouth is awkward and not the best way to play it.

Put the reed about half-way into your mouth and close your lips lightly over it, resting the reed on the dry, outer side of your lower lip. Squeezing too hard with the lips is a common mistake of beginning players. Relax. Get high and low notes by subtle changes of lip pressure, mostly accomplished by slight up and down movements of your lower jaw. These movements change your lip pressure and the length of reed that is allowed to vibrate.

Practice doing a sliding scale, like a police siren, with smooth transitions from low and high notes. The low notes are easy. Keep working on extending the upper range of notes. After you can do a sliding scale, which includes an infinite number of notes, practice tooting specific notes out of that infinite number of possibilities. With some practice, you can start picking melodies out of your memory, or improvising new melodies of your own. It's as easy as singing, only you don't use your vocal cords. Just blow, but you still use a lot of subtle mouth movements. You also have to learn breath control.

Because the volume of air needed to blow a tootophone is so much less than that needed for most other reed instruments, you can make much longer strings of connected notes than you can with the other instruments. Try to maintain relaxed breathing. I sometimes exhale a little air through my nose while playing if I have too much air for comfort. Blowing a tootophone should not tire you out. It should be almost as effortless as normal breathing.

This Youtube link will help: http://www.youtube.com/watch?v=h_f7W-J9Sr8

Most of the note selection is done with the mouth, but notes can be modified with a wah-wah effect done with the hands, which is demonstrated in the Youtube video.

Although the tootophone is a reed instrument that is blown into, not a kazoo, you can also "sing" into it using your vocal cords for some advanced technique effects. You can even blow two notes at once this way and play around with resonance frequencies!

Practice. Practice. Practice.



Step 8: Mass Production

I suggest that everybody start out making a few tootophones with hand sanding. For those of you who get enthusiastic and want to supply the needs of others; selling or giving away tootophones, you can speed up the sanding process considerably by using power tools.

Here you can see my belt sander mounted upside-down on my workbench (holes drilled in the table and wire used to tie the sander handle down). A tool rest surface is held by my vise to rest a special sanding guide tool on. To keep plastic dust from getting sucked into the motor, a PVC pipe hood extends the air intake away from the sanding action.

Since the metal guides on my tool are not perfectly shaped, I usually have to do a little hand sanding after the power sanding. Even so, the power sanding saves a whole lot of time when you are making hundreds of tootophones.

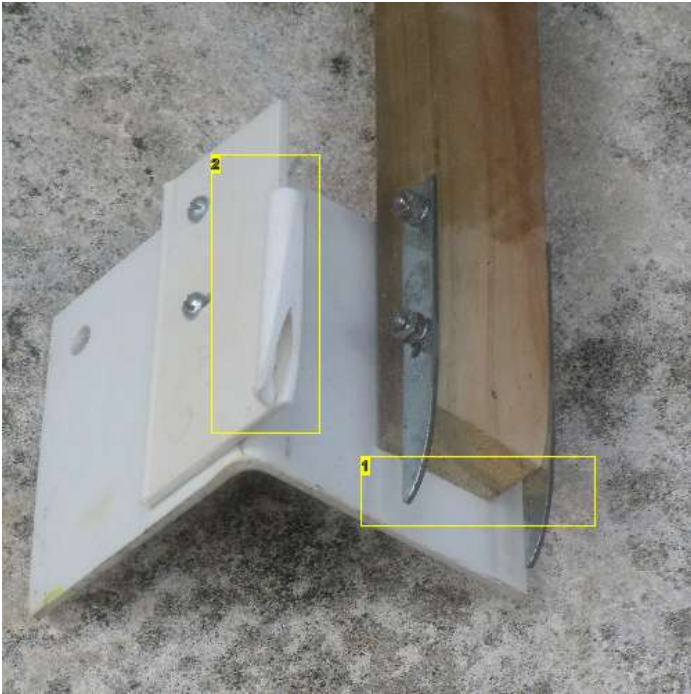


Image Notes

1. Identical metal curvature guides are bolted together and shaped at the same time on a grinder.
2. This heat formed PVC unit holds the syringe while sanding. It has a tight, press fit.

Image Notes

1. This is a special tool for grabbing onto the finger wings on the syringe, to help grab it and pull it out of the holding unit after power sanding is completed.
2. This is a special tool for grabbing onto the finger wings on the syringe, to help grab it and pull it out of the holding unit after power sanding is completed.

Step 9: Music sample

This is a digital collage I did called "Party After the Concert".

A tootophone can be played in a variety of ways. You can even sing into it while playing and get some interesting interference patterns going. Although I can play standard tunes, I prefer to just improvise.

Here are two sample recordings. One has three standard tunes demonstrating the three playing configurations of the Pocket Tootophone. The other demonstrates the jumbo sax tootophone with one hand and drums with the other.

Click on the dog-eared page icons below to open the MP3 music files.



File Downloads



12-3-23 drum and tooter - does it.mp3 (2 MB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to '12-3-23 drum and tooter - does it.mp3']



POCKET TOOTER.mp3 (1 MB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'POCKET TOOTER.mp3']

Related Instructables



Hypotooter -- a mini-musical instrument by Thinkenstein



Tiny Tootophone by Thinkenstein



Tootophone Sax and Trumpet by Thinkenstein



Jumbo Sax Tootophone by Thinkenstein



pvc "TOOTOPHONE" -- a musical reed instrument by Thinkenstein



Baby Bass Tootophone -- a reed instrument by Thinkenstein