

Acoustic Guitar Pickup

by [adamkumpf](#) on March 8, 2006

Table of Contents

intro: Acoustic Guitar Pickup	2
File Downloads	2
step 1: Making the Pickup	2
step 2: Specifications:	3
step 3: Installation: Step #1	4
step 4: Installation: Step #2	4
step 5: Installation: Step #3	4
step 6: Installation: Step #4	4
step 7: Installation: Step #5	5
step 8: Installation: Step #6	5
Related Instructables	6
Advertisements	6
Make Magazine Special Offer	6
Comments	6

intro: Acoustic Guitar Pickup

Turn your acoustic guitar into an acoustic/electric! This is a simple and inexpensive design you can make at home to get that special one-of-a-kind sound you've been looking for.



File Downloads



blues-riff.mp3 (253 KB)

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



chords.mp3 (244 KB)

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



harmonic.mp3 (220 KB)

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



solo1.mp3 (195 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'solo1.mp3']

step 1: Making the Pickup

Parts you will need:

1. Piezo Buzzer Element
2. about 1 foot of shielded audio cable
3. a 1/4" audio jack (that can be mounted on the guitar body)
4. a small amount of medium density foam. (just a couple square inches)
5. soldering iron, solder, wire strippers, hot glue gun, and hot glue

- The first step is to design and create your pickup. The heart of the pickup is a piezo buzzer element. You can find these for just a couple dollars at your local parts store. (Radio Shack) Sometimes the Piezo Buzzer packages don't have that much information on them, but you want to find things as close as possible to the information listed on the "Specs:" page. In other words, they are pretty cheap so go for a good one. Also note that you do not need a fully functional buzzer device... just the Piezo element.
- A word about Piezo Elements. Piezo elements are made from two conductors separated by a layer of piezo crystals. When a voltage is applied across the crystal layer, the crystals pull on one side and push on the other. This in turn bends the metal conductor layers. When a sinusoidal signal (audio) is applied, the conductors are pushed and pulled very quickly, creating sound waves. The beauty of the Piezo element is that it also can be applied reversely. If sound waves push and pull on the conductors, an electrical signal is created and can be output to an amplifier or recording device. This is exactly how we will use the Piezo Buzzer element in this project. It will be attached to the inside of the guitar body, and, as the body vibrates, the sound will be turned into an electric signal by the Piezo buzzer element.
- Now that you have the Piezo Buzzer, you need to carefully break it open and get out the piezo element. Be careful not to hurt the metal device inside. Bending the element may cause it to break or lose some of its sensitivity.
- You are now ready to solder the device together. Strip the ends of the shielded audio cable. On one end connect the signal wire to the center of the Piezo element and the ground/shielding to the metal/brass surface of the piezo element. On the other end of the shielded wire, connect the signal wire to the signal tab on the 1/4" audio jack and connect the shielding to the ground tab.
- We have found that a small piece of medium density foam improves the performance of the pickup over a large number of frequencies. (If you are familiar with circuitry, feel free to experiment with combinations of capacitors and resistors to cut undesired frequencies) Cut a piece of foam the same size of your piezo element and about 3/8" tall. Place a large drop of hot glue on the back side of the piezo element (where the wires connect) and then press the foam on until the glue cools.
- Your piezo pickup device should now be ready to install. You may want to make sure it is working by plugging it into an amp and lightly tapping on it.

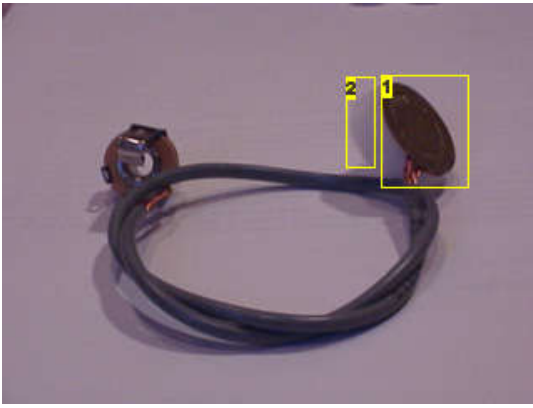


Image Notes

1. piezo element
2. foam backing glued to the element

step 2: Specifications:

Transducer Type: Piezo-electric
 Transducer Size: 1.1"
 Audio Range: 106 dB
 Noise Level less than -111 dB
 Output: 1/4" Female Audio Jack
 Wiring: High quality shielded audio cable
 Installation Time: about 1 Hour

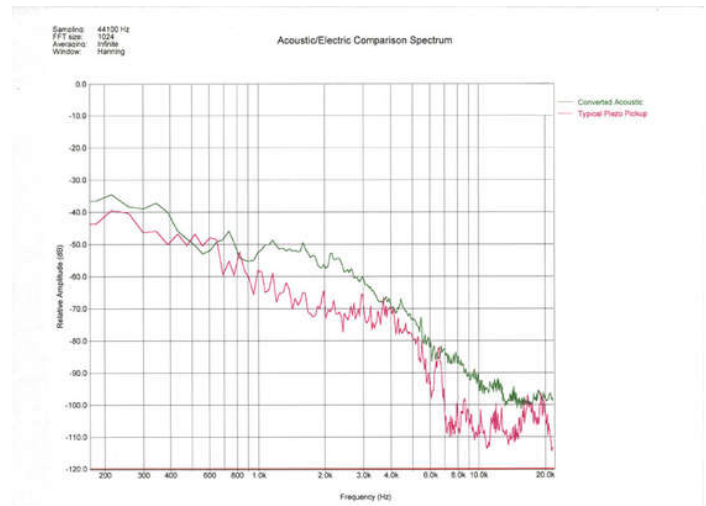
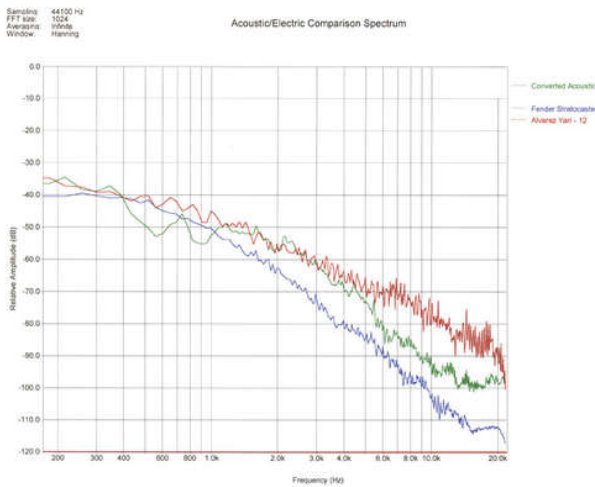
The first graph shows a guitar with my pickups installed vs. an Alvarez Yari 12 string (This guitar is a professional model and has individual pickups for each couplet of strings. That's 6 pickups in all), and a Fender Stratocaster. The Fender Strat. is included because it is known for its full vintage sound with professional pickups.

From the graph you can see that the Alvarez is the best due to its overall amplitude and trend. It does however seem to be somewhat inconsistent above 6.0kHz. The Fender electric guitar has a very smooth curve, but as you can see, the high frequency response is low and the overall amplitude is well below the Alvarez. The green curve shows the frequency response spectrum of my piezo-electric pickup installed on an inexpensive guitar. While the amplitude is slightly lower from .4 - 1.0kHz, it more than makes up for this by its great mid. and hi frequency amplitudes. It sounds great plugged-in and lets you turn up the amp pretty loud before giving any feedback.

The second graph shows the difference between our piezo pickup and a generic piezo pickup installed on a guitar.

The green curve on the top is my homemade pickup while the pink curve on the bottom is the spectrum of a generic piezo element. It can easily be seen that getting an element with good specifications is very important. The piezo element I chose has a fuller sound across the entire spectrum. Also notice that the generic pickup lacks smoothness.

This is why it is important to choose wisely from all of the parts at your local electronics store. Getting a piezo element with the specs above will help to get you on the curve we obtained from our pickup, making sure you get a full, rich sound every time you plug-in.



step 3: Installation: Step #1

The first step is to get all of your supplies together. This is what you will need to turn your acoustic guitar into an acoustic/electric guitar.

- 1 Piezo-electric transducer pickup. (The main part)
- 1 Electric drill.
- 1 3/8" drill bit. (Use a spade bit)
- 1 Roll of double-stick tape / or hot glue (recommended) / or sticky putty
- 1 Roll of masking tape.

step 4: Installation: Step #2

The second step is to mark where the hole will be in the body of the guitar. Unless you are handy with a soldering iron and have an endpin-jack on-hand, do not place your hole in the end of the guitar. This is where the pin that holds the strap is located. There is a block of wood there and the provided jack will not work in this position. I recommend marking the hole about halfway through the curve on the end of the guitar. It is, however, up to you where you choose to put it. Be creative! You will probably want to mark the spot with pencil first, then take the tip of the drill bit and twist on the mark by hand (not in the drill) to make a small indentation in the wood, as seen in Figure 1. Endpin jacks are a stronger and more professional solution, but will also probably double the cost of this project for you.



step 5: Installation: Step #3

Next we must drill the hole. This is the most difficult part of the installation process. It is in your best interest to take the tension off of the strings to get rid of forces that may be pulling on the wood. You may want to practice drilling holes on a scrap piece of wood if available to get a feel for the drill. Using a good sharp 3/8" spade bit, as seen in Figure 2, very slowly (fast drill speed, very little pressure) and carefully drill the hole in the body. Be steady and smooth or you may cause the body of the guitar to splinter around the hole.



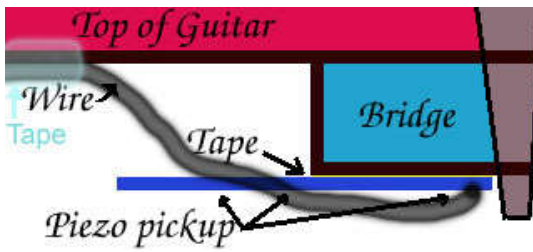
step 6: Installation: Step #4

Carefully clean the edges of the hole, shown in Figure 3. Take the washer and nut off of the 1/4" jack. You must now feed the jack into the guitar body and direct it towards the hole you just drilled. Depending on the size of your hand, you may need to take the strings completely off to get your hand in far enough to guide the jack towards the hole. I usually just loosen the strings, (very loose) and squeeze my hand in as far as it will go, as seen in Figure 3b. It is almost certain that you will not be able to reach the drilled hole. This is okay. Just be patient and keep fishing for it. You may find it helpful to use something such as a paperclip or a pencil to help guide you through the hole. Once it is through, put the washer and nut back onto the jack to hold it in place. Do not overtighten the nut. Make it too loose and it will come off... Make it too tight and you will have a guitar with a crack in it... A little loose is better than too tight! If you are worried about the strength of the jack in the side of the guitar, you can easily make a sheet-metal washer for the inside of the guitar to help support it.



step 7: Installation: Step #5

This step is a very important part if you want your guitar to have a nice sound. You are now going to mount the piezo element. Be careful with the element. Piezo pickups can be broken if you bend them. Although it may seem odd, your pickup will produce a much better sound if you mount it hanging off of the guitar, 50-50. In other words, half of the element (brass side) is taped to the bridge (or a brace), and the other half is hanging out in mid-air. The best place to mount the piezo element is on the back side of the bridge. (the side towards the endpin) To apply the pickup, take a piece of double-stick tape, just enough to cover half of the element, and place it on the element. You may also want to use hot glue once you have found the best place on the guitar, as this improves the .4k-1.0kHz range of the pickup. A lot of people also use a sticky-putty, available at a local office supply store. The half of the pickup with tape (or glue or putty) will be the part that sticks to wood on the inside of the guitar. The other half will be hanging off. Try to keep the adhesive (tape/hot glue/putty) as thin as possible as this will help overall performance. It is also important to note that the placement of the piezo element can also be used to boost frequencies from .25-3.0kHz depending on how much of the device hangs in mid-air. Play around with different placements if you want your guitar to have a unique sound. Typically, the closer the pickup is to the bridge, the warmer the sound.



step 8: Installation: Step #6

The hard part of the installation is over. Now for the finishing touches. First, you must secure the loose wire that runs from the pickup to the jack so that it does not flop back-and-forth when someone you the guitar. Go in through the sound-hole and place generous pieces of masking tape to secure the wire. Next you may want to snug the nut on the jack to finalize its placement. Then tighten up the strings and plug it in! That's it. You just made your acoustic guitar into an acoustic/electric!

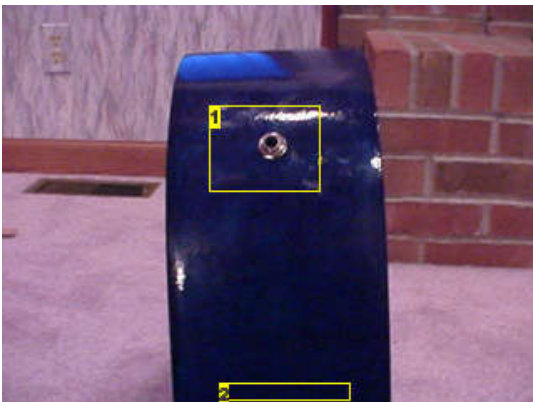


Image Notes

1. 1/4" Audio Jack
2. alternate placement (endpin jack)

Related Instructables

Subscribe to MAKE and get 5 ISSUES for the PRICE OF 4!
Build, Hack, Play, Make

SPECIAL OFFER FOR INSTRUCTABLES
MAKE Magazine

BONUS ISSUE
» Get a FULL YEAR plus a BONUS ISSUE for only \$29.95



Comments

50 comments [Add Comment](#)

[view all 138 comments](#)



bassmann says:

does anyone know if this works for acoustic bass ????

Oct 14, 2008. 5:18 PM [REPLY](#)



sn3102 says:

Bassmann....You might want to consider the same parameters for your bass. Pickup placement is critical. Experiment and you will see the variety of tones you can get.

Jun 1, 2009. 6:49 PM [REPLY](#)



Scrubsfan1234 says:

you may need to find out the frequency of bass notes, then get a piezo that picks up the lower frequencies.

Feb 1, 2009. 5:34 PM [REPLY](#)



sn3102 says:

Another comment I have is about the piezo pickups. Placement of the element is critical the sound you want to create. Neck placement gives you a thinner sound, body placement more bass. I do not know what the frequency response of a buzzer is but it must be limited. I would try pickup placement with the amp controls set flat and get the best sound you can get. Then there will be room for tone adjustment later.

Jun 1, 2009. 6:45 PM [REPLY](#)



sn3102 says:

In the process of drilling a hole in the bottom of the guitar body, be careful. I think that goes without saying. When you go to tighten the hex nut holding the washer be careful not to tighten it down too hard. In this action you are tightening down a flat washer and a flat hex nut onto a curved surface. Tightening down the hex nut with too much torque will crack the wood.

Jun 1, 2009. 6:36 PM [REPLY](#)



golden22 says:

Wait, do you put the piezo on the inside of the guitar or the outside? does anyone have pictures of the finish product?

May 25, 2009. 5:15 PM [REPLY](#)

Thanks



asimmonds says:

WHERE CAN I FIND MEDIUM DENSITY FOAM?!?!

Apr 23, 2009. 1:45 PM [REPLY](#)



asimmonds says:

how many prongs is the 1/4" female supposed to have, 2 or 3?

Apr 21, 2009. 3:52 PM [REPLY](#)



bdiddy22 says:

instead of doing all this "wire pulling" stuff, try a 1/4" wooden dowel rod. insert it into the hole you just drilled and towards the soundhole. then just "plug" the jack onto the dowel rod and pull it through. i used to work as a guitar tech and this was the easiest way to pull the jack to the drilled hole.

Apr 14, 2009. 5:23 PM [REPLY](#)



team_nes_1986 says:

If you want a more Les Paul sound, take the speaker out of an old telephone handset and use it in place of the piezo.

Apr 8, 2009. 7:58 PM [REPLY](#)



marcoandrade says:

Yeah! I have just finished mine! It was really a 25min task. I live in Brazil and do have an acoustic guitar that I use to play my Pink Floyd chords and church during the weekend. Incredible how it sounds clear and noiseless. The most interesting point is that I used an old "press me and listen" plush toys from my daughters to get to this piezo buzzer! Congratulations for the tip and thank you as well. No doubt I could save a good amount of Dollars using this amazing instructable!

Apr 6, 2009. 5:18 PM [REPLY](#)



boognishmofo says:

Jan 13, 2009. 10:27 AM [REPLY](#)

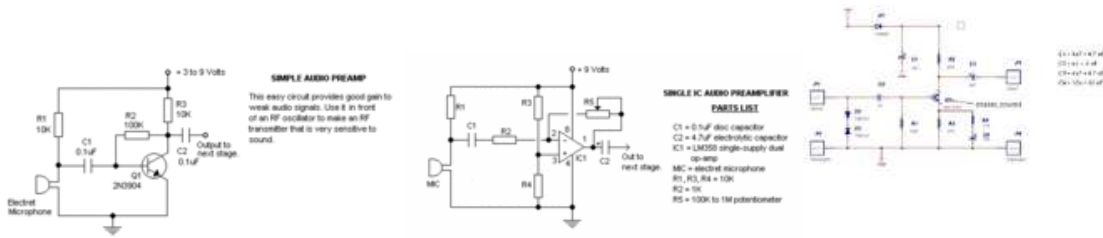
i am a little confused on what the final product should be? in the picture it looks as if there is a stand that holds the pickup above the strings, it looks like it would interfere with your strumming hand. can this setup be used with a stereo that has a mic input jack if I dont have a amp?



tigerdog330 says:

Mar 20, 2009. 3:15 PM [REPLY](#)

heres a link to a few of them.. in case you cant open the pages for some reason im attaching 2 of the schems as pics.. so im def. gonna try 'preamp schem 2' and 'preamp schem 3' i might try the other one once i get more money cuz that one has more parts than the others



tigerdog330 says:

Mar 20, 2009. 3:16 PM [REPLY](#)

ps where it says 'electret microphone' it just means thats the input.



tigerdog330 says:

Mar 20, 2009. 3:08 PM [REPLY](#)

sort of.. i did something like this and i use a set of computer speakers with it (because i dont have an amp) then i tried it with a different set of computer speakers and it didnt work.. then i did some research and figured out that:
-the impedance of the piezo is to high for most amps to handle
-and, technically, you are supposed to have a preamp in there to act as an impedance buffer.
these preamps can be made fairly easily with minimal parts for cheap.
i found 2 great schematics for some mad simple ones that ill attach if i can find them again.. i think i know where they are though so it should only be a few minutes.



FirstAttempt says:

Mar 17, 2008. 10:15 PM [REPLY](#)

If you can't find a pizo buzzer element with 106db audio range, but can find others with lower and higher ranges, such as 96db and 115db, should you go lower or higher?



adamkump says:

Mar 1, 2009. 12:05 PM [REPLY](#)

For the buzzer, the db rating is how loud the sound will be when used as a speaker. If the internal circuitry and power was identical, a larger db rating would indicate higher efficiency (probably a good thing). I would imagine that there are too many variables (unless you are digging through detailed specification sheets) to know for sure from the db rating alone.

If getting the right tone/volume is very important to you, you should probably try them both. Otherwise, you can use a rule-of-thumb that larger/thinner elements will have better low frequency response and smaller/thicker elements will give a better high-end tone.



lurk_hard says:

Jan 31, 2009. 8:40 AM [REPLY](#)

Im not quite sure if I'm supposed to post questions here... but if I wanted to wire 2 piezos together, would I just solder a ground wire and signal wire from one piezo to the other?



benhu says:

Feb 4, 2009. 9:23 AM [REPLY](#)

You can connect in any way , it works in both ,means consider s and g terminals of wire and middle(m) and base(b) terminals of piezo > then connect g --- -b1 ,m1----b2, m2----s. and all is completed.



lurk_hard says:

Feb 1, 2009. 1:55 PM [REPLY](#)

never mind i figured it out



benhu says:

Jan 24, 2009. 1:32 AM [REPLY](#)

help me
in the case of my guitar i donot have bridge pins , hence i am not getting a proper signal output....
anybody suggest the place where i should place the piezo element



StabbyJack says:

Feb 16, 2008. 3:33 PM [REPLY](#)

thats the coolest thing ever. If you can remember I'd like to know how much do the parts cost



dycmaker8 says:

Nov 17, 2008. 1:28 PM [REPLY](#)

Radio Shack part number 273-073a is the piezo @ \$1.99 ., i don't bother removing the plastic case., i just remove the sticker from the back side, clean it off and use hot glue to stick it inside the guitar top., my personal preference is about 3 *below the bridge and about halfway to the side of the guitar on the bass side.* *sound tends to be fairly balanced at this location for a typical dreadnaught.* *tweak sound futher with your P.A. Shack part number 274-252 is a package of (2) 1/4" mono jacks for \$2.99. yo.*



1nsomn1ak says:

Jan 23, 2009. 1:08 AM [REPLY](#)

I like the "series" config. Just be sure to note that generally using Series with pickups (at least the coil relatives) will create a higher output and this a more usable signal than using "parallel", which could result in just under 1/2 the volume but with more clarity on the high-end. So, it depends on what you're looking for. I jope these will work w/ nylon strings!

"1nsomn1ak



king of shaws says:

Jan 21, 2009. 1:58 PM [REPLY](#)

I've always wanted an accoustic-electric, (they don't makem in my size) I am so totally building this



Sworch says:

Dec 18, 2008. 7:01 PM [REPLY](#)

cool instructable but I have a couple suggestions. The first is to wire 2 piezos in series. This means to go from one conductor in the shielded cable to one wire on the first piezo then connect the other wire on the first piezo to one wire on the second piezo. The last wire on the second piezo should then be attached to the second conductor in the shielded cable. The jack is attached to the other end of the shielded cable as described. Experiment with pickup placement (I generally attach the beneath the bridge, one near the high strings and the other near the low.

The second suggestion is that these pickups can be used to amplify anything that vibrates. I've put them on pianos, xylophones, solid body guitars, big pieces of hanging sheet metal, the exterior of glass jars half full of water etc. Just experiment, they are extremely versatile.

The piezos can also be cut to smaller sizes. Just use a sharp pair of scissors and be careful not to cut through the solder points where the wires are attached. It helps to carefully hold them with a pair needle nose pliers.

Try to amplify them with a high fidelity amplifier (like a PA system) rather than an electric guitar amp. Electric guitar amps aren't voiced properly for this type of pick up. They are designed for magnetic coil pickups. A high fidelity system will deliver much more accurate results without so many feedback issues.

Finally, if you become as addicted to these as I am, I recommend picking up a preamp for them, this will balance their signal and make them much more flexible. Search for "Piezo transducer preamp" and get some names. If you want any specific recommendations email me and I'll try to help you out.



naught101 says:

Dec 26, 2008. 1:53 AM [REPLY](#)

Why two in series? Would that create a phase difference between the mics? or is that the point? Why not in parallel?

Can you give some rough specs for an appropriate "piezo transducer preamp"?

cheers
ned



Sworch says:

Dec 27, 2008. 6:37 PM [REPLY](#)

As for the 2 pick ups in series, as far as I understand it, there is a phase difference between the 2 pick-ups which buffers the signal and cuts down markedly on the harsh, brittle response of a single piezo. I must admit that I'm a little fuzzy on the specifics of why this is the case but I can tell you with absolute certainty that it really works and is well worth the effort.

The real trick is in the placement. This can be tricky because you won't really have a good sense of the response of the pick-ups until after they are adhered. You can use double stick tape for rough placement but firmly gluing the pick-up in place is ultimately pretty critical. I always use gel type superglue. An other tip is to place a small blob of silicon on the solder points of the pick-up to reinforce the wires. It is very annoying to accidental pull these off when you're trying to attach the pick up.

For a preamp use a Sansamp ParaDriver DI. It is extremely flexible.
<http://www.tech21nyc.com/paradriverv.html>

Fishman makes a number of good models too
<http://www.fishman.com/products/details.asp?id=42>

You should be able to get tech specs there.

good luck.



dcgud75 says:

Dec 7, 2008. 12:37 PM [REPLY](#)

I just read what the guy said before me about the forstner bit. That is also a very good bit to use. Either one of those bits would be great to use. Alot better than a paddle bit.



dcgud75 says:

Dec 7, 2008. 12:36 PM [REPLY](#)

I have been a carpenter for about 4 years now. I have built guitars and cabinets alike. When I have an important hole to cut that I want to be very clean I ALWAYS use a BRAD POINT BIT. They are designed for clean cuts. Paddle bits or (Spade Bits) as you called it are more for rough work. Its also important to go slow when drilling dont get in a hurry, you will regret it. Great guide though. Just thought I might extend some of my experience.



Ferrite says:

This works great!!!

Dec 6, 2008. 3:40 PM [REPLY](#)

I made 2 for my cello, one for each side of the bridge, and it sounds great. I did make a slight modification by instead of using an output jack, I soldered half of an stereo audio cable with 3.5mm jacks to the piezo disk instead of using the 1/4 female adapter on the other end.

Great Instrucatble.



everyman789 says:

If you drill the hole with a Forstner bit you will have no splintering at all.

Dec 6, 2008. 4:15 AM [REPLY](#)



nantupagla says:

Great project. Works pretty good. I didn't even think that it would work. But it does.

Dec 3, 2008. 6:24 AM [REPLY](#)



jimmyhavok says:

I got a choking feeling when I saw step 5, drilling a hole in the guitar. The project sounded great up to that point, but even now I get shivers when I think about putting a hole in my baby. But I guess if you want a pickup on your guitar you've got to have a way to get the electricity outside. I wonder how this would work on an electric?

Jan 29, 2008. 3:00 AM [REPLY](#)



overcaffein8d says:

you could also remove the peg for the strap or even put the wire through the sound-hole

Nov 2, 2008. 9:44 PM [REPLY](#)



TheMadTinker says:

It is perfectly possible to do something like this without drilling into your guitar. Wiring an inline 1/4" female jack to a piezo, and sticking the piezo to the top of your guitar near the bridge using some sticky-tack (that stuff that discourages college students from putting lots of holes in the walls of their dorm rooms) is a nice solution that carries little danger of damaging your guitar.

Oct 2, 2008. 6:50 PM [REPLY](#)



bigredlevy says:

this works a treat.

Oct 15, 2008. 3:56 AM [REPLY](#)

getting a bit of feedback though. tried through peavey and vox, both have feedback.

i mounted the piezo to the guitar with bolts through the original plastic casing, could this be the reason for feedback problems?



bassmann says:

does this work on an acoustic bass ????? reply to me if you know the answer

Oct 14, 2008. 5:20 PM [REPLY](#)



bigredlevy says:

there is no reason this would not work on a bass guitar.

piezo transducers pick up a lot of high end frequencies though, so just make sure you locate the pickup in the right place on the body.

Oct 15, 2008. 3:48 AM [REPLY](#)



LeviMan_2001 says:

I bought myself one of these, and I've got it all wired up, when i tap it it makes tapping noises but when i hold it on my guitar it wont work! kinda frustrating i wanted a acoustic sound from an electric I'm building (but no it doesn't make sound on an acoustic either). guess i might just have to go magnetic.

Oct 3, 2008. 9:49 PM [REPLY](#)



LeviMan_2001 says:

looks like i just found my problem, i had a bad potentiometer! well now i guess we'll just have to have it peizo/magnetic! cool.

Oct 4, 2008. 1:11 AM [REPLY](#)



tac135 says:

Would this be worth doin to a nice guitar, cuz i dont know if i want to do this to my guitar.

Sep 27, 2008. 6:12 PM [REPLY](#)



salvete_omnes says:

I'm definitely gonna try this; I'll need it for the psychotic guitar I'm building.

Jul 31, 2007. 12:14 AM [REPLY](#)

One question: know any electronics that use piezos that I could easily find in a thrift store? I'm thinking alarm clocks or old handheld games (like that old football one), but I'm not entirely sure.



busteddit says:

maybe try a small speaker, like in a cell phone or old headphones? electret or condenser, i know some speakers can be used as a mic in apinch, but the quality is not the same, but how much better could a tinny piezo sound anyway (in comparison)

Jul 30, 2008. 8:38 AM [REPLY](#)



DIY Dave says:

Can you still use it as an acoustic guitar also?

Jul 24, 2007. 6:41 PM [REPLY](#)



adamkumpf says:

yes! :)

there should be no noticeable difference in the sound after installing the pickup... although an audiophile would certainly point out that altering the resonant body of the guitar at all will change its response ever so slightly.

Jul 25, 2007. 9:10 AM [REPLY](#)



SpeakupforRonPaul says:

Wierd that site contactmicrophones ddotcom has a home-made theremin that makes mario-world sounds.

Jan 13, 2008. 2:08 AM [REPLY](#)



busteddit says:

how much does the theremin go for? most ive seen are light sensitive (optotheremin)and not magnetic field like a true Theremin, and usually overpriced. seen em on sleezbay from 20 up to 80, but u can probably do one for under 10, even less if u have some stufflying around.

Jul 30, 2008. 8:34 AM [REPLY](#)



bobdwilliams says:

Get the M1A active pickup LR Baggs unit. I installed it on my Martin D-1 acoustic and made a slide show then posted it on youtube. Here is the link if anyone wants to view. The clip explains all...<http://www.youtube.com/watch?v=9ZKoev50YDc>
Bob

Jul 1, 2008. 2:14 PM [REPLY](#)



gez says:

and i couldn't understand where must we place the piezo element? can you show the part you're showing zoomed in a full guitar pic?

Jun 7, 2008. 4:38 AM [REPLY](#)

very nice work!

[view all 138 comments](#)