

## Piezo Disks, Audio Schematics and a Condenser Mic

The schematics and diagrams here are provide the basis for sonic investigations using piezo disks and mics along with the construction of practical preamps and flexible compact audio mixers.

The diagram for making a 'plinky' describes the process for soldiering a piezo disk and attaching to it harpsichord wire which when plucked or heated will release an astonishing array of sounds. By choosing to not attach the small pieces of harpsichord wire to the disks, one will make a very sensitive contact microphone.

Piezo disks are available for many sources and have the virtue of being inexpensive, rugged and sensitive. They are incredible contact devices--they're use is limited only by imagination, and ingenuity. They may be taped to any surface--use care when attaching to instruments so as not to damage finished surfaces.

I have used them for more than twenty years to amplify (in live performances) and/or to record:

- |                                |                                 |
|--------------------------------|---------------------------------|
| automobile antennae            | raindrops                       |
| bamboo                         | plants                          |
| barbed wire fences             | skateboards                     |
| bowed bamboo tubes             | slinkys                         |
| bicycle wheels                 | snowfall on grass mats          |
| boat gunwales                  | spider webs                     |
| bridges                        | toys                            |
| burning adhesive on metal tape | trees                           |
| cactus thorns                  | tuning forks through steel wire |
| credit cards                   | voices through paper            |
| floppy disks                   | voices through metal cans       |
| heartbeats and pulse           | wind blowing over rocks         |
| heated metal                   | wind harps                      |
| insects                        | window screens                  |
|                                | .....                           |

The condenser Microphone is small, fairly rugged and good for putting inside of small objects, guitars, violins, etc. When using them inside of instruments, I strongly advise to keep the levels low--just a bit above line level can be very effective. The diagrams and schematics may be freely shared. I would appreciate the acknowledgment when they have proven useful.

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# How to Solder a Piezo Disk and make a Contact Microphone

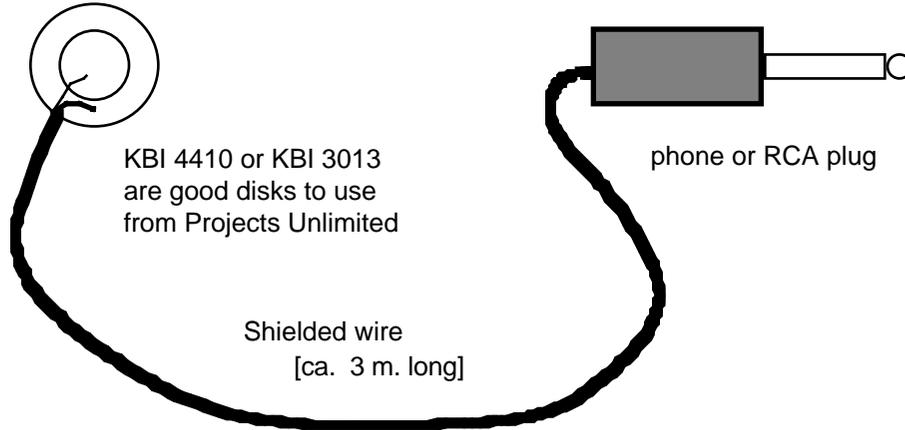
Richard Lerman  
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Note: Piezo Brass Disks or 'benders' are available as surplus

In the US, the best current source is:

Projects Unlimited  
3680 Wyse Road  
Dayton, OH 45414  
513-890.1918

other sources are  
All Electronics in L.A.  
& Radio Shack/Tandy



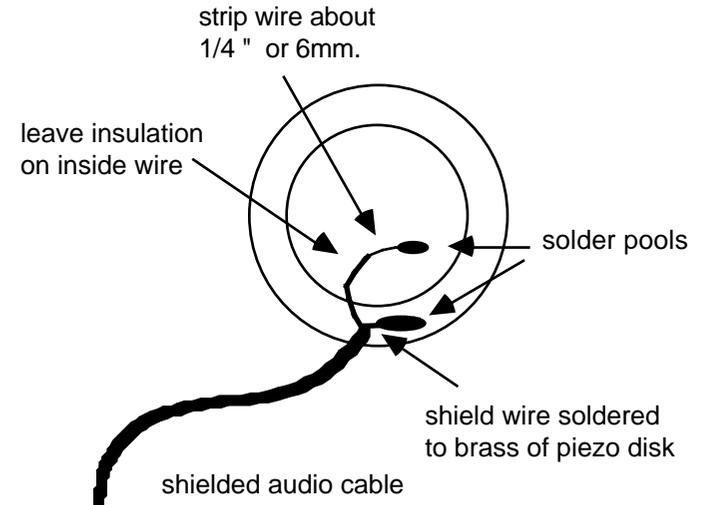
NOTE: if you make this wire longer than it needs to be, there will be less stress on this solder connection, which is weaker than the other

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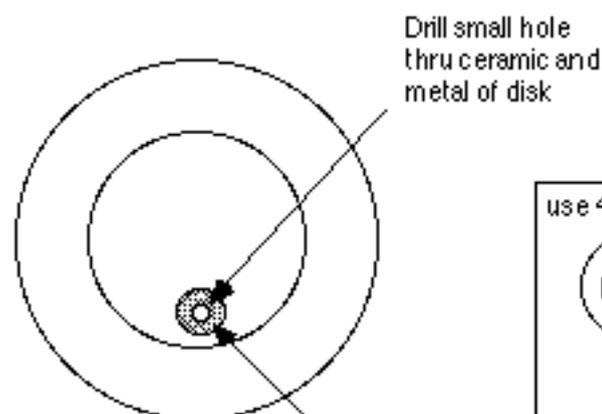
## SOLDERING DETAILS

1. Tin both the inside or "hot" wire and shield
2. Apply a small pool of solder about 12mm x 4 mm (1/2" x 1/4") to the brass for the shield wire
3. Hold tinned shield wire on this pool with soldering iron. Tinned shield will flow into the solder pool making both a very strong solder connection and strain relief
4. To solder onto piezo ceramic, you must use a very clean soldering iron--about 20 watts maximum
5. Apply very small pool of solder to the piezo disk
6. While holding insulated wire, reheat solder pool and put tinned end of wire into pool.



## Making a Piezo Disk into a Contact Microphone without solder.

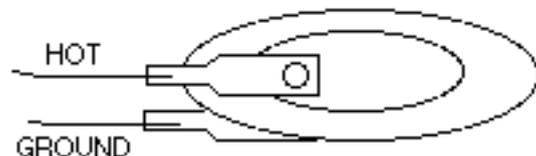
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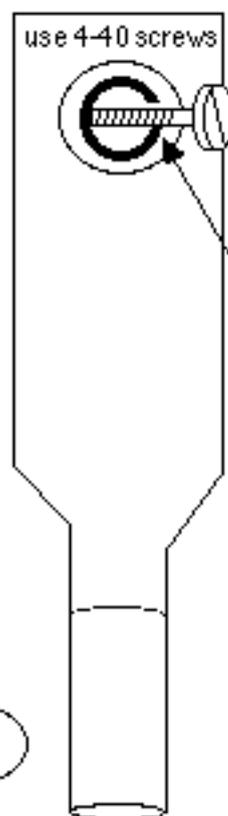
carefully scrape piezo ceramic material away from the drilled hole using a knife or screwdriver. This will leave a small bit of metal exposed on the top side.

When this is tightened with the nut, the connections will never come undone.

SIDE VIEW



The spade lugs can be crimped onto the HOT and GROUND of a SHIELDED AUDIO wire.



put very small rubber washer or wire insulation inside spade lug. Metal screw will then NOT MAKE CONTACT with ceramic material or the spade lug, but will only MAKE CONTACT on the back or ground side of the disk

This connection will last longer than one which is soldered. Because no lead has been used it is suitable to give to young children.

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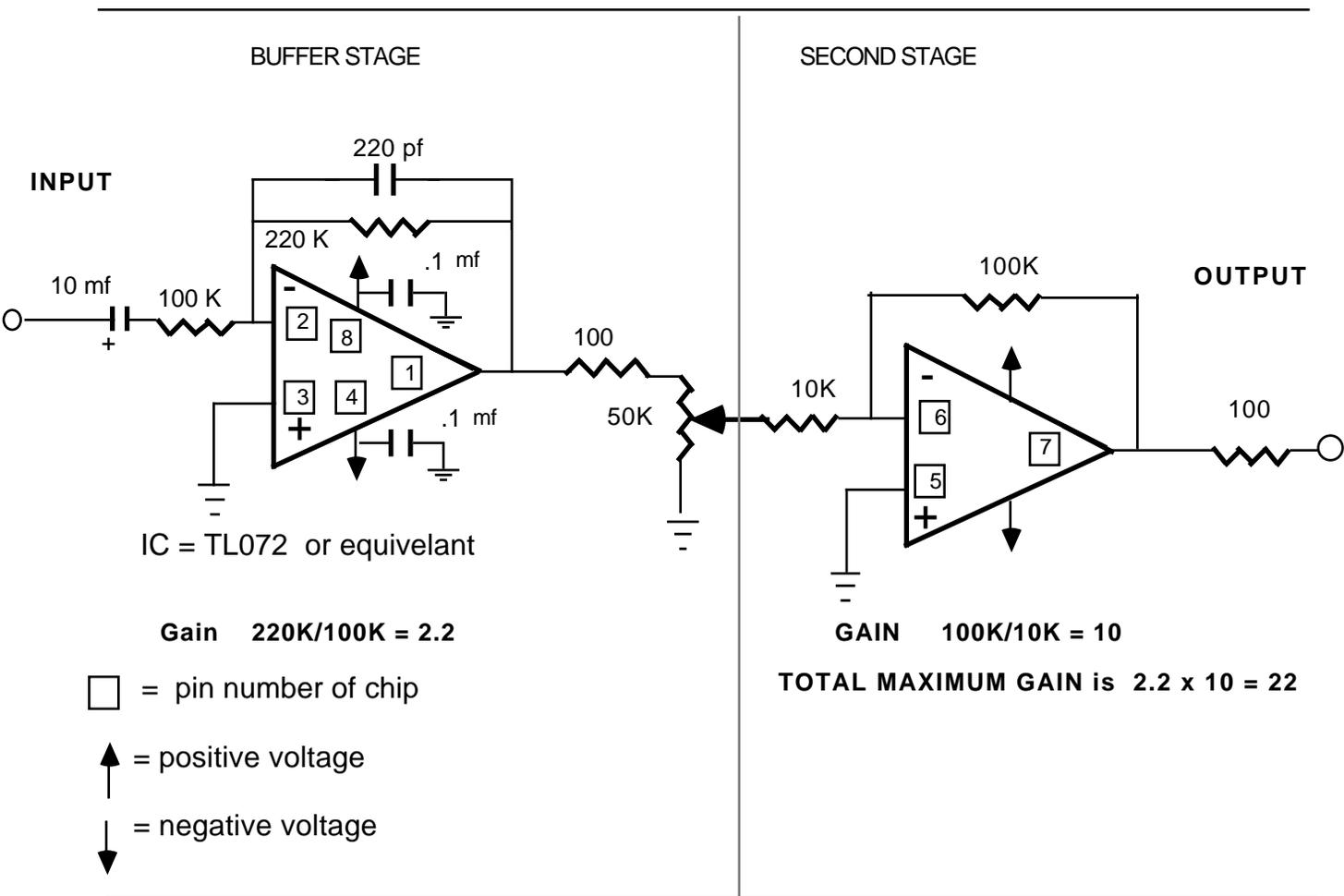
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# Schematic for preamps for piezo disks

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This is a good, and quiet preamp for any piezo disk applications. There are other variations and combinations that work better. A preamp made in a single stage will be quieter, but usually, electronic noise is not a factor in working with Piezo materials. The buffer stage here is basically an impedance changer. Because the gain is kept relatively low, the slew rate, (how fast the preamp can respond) works well with little distortion. Because the impedance has been changed by the first stage, the larger gain of the second stage is less of a problem.

Use any power supply from  $\pm 9$  volts to  $\pm 18$  volts. This can be run from two 9 volt batteries. Some of the newer chips on the market can be run with only one battery. Explore



pin 1 = out amp a  
 pin 2 = inverting in amp a  
 pin 3 = non-inverting in amp a  
 pin 4 = negative voltage

pin 5 = non inverting in amp b  
 pin 6 = inverting in amp b  
 pin 7 = out amp b  
 pin 8 = positive voltage

NOTE: TL072 is from Texas Instruments. 5532 chips from Signetics are quieter, but the large voltage input from some piezo applications can destroy the inputs of these chips.

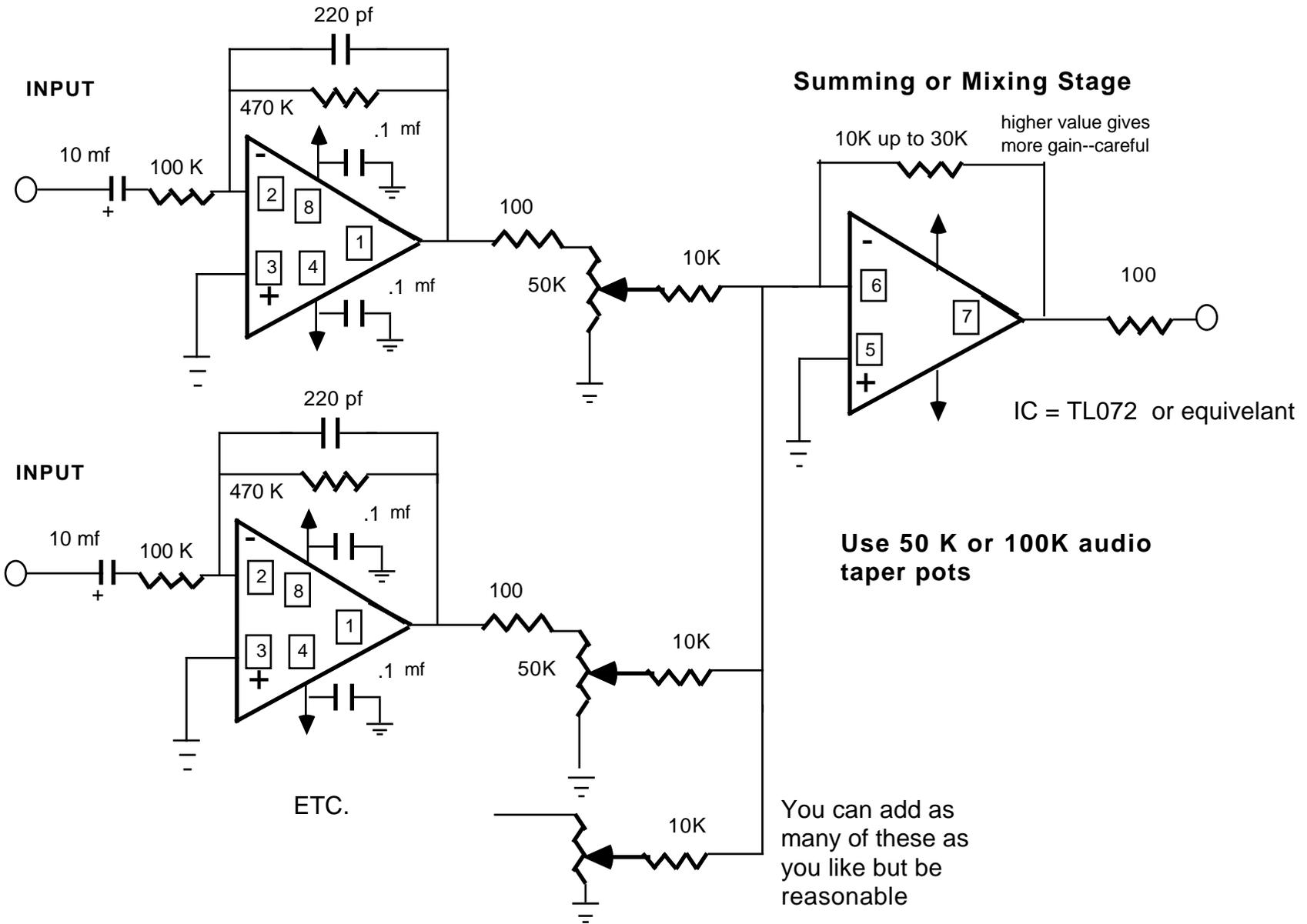
# Preamp/Mixer

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□ = pin number of chip

↑ = positive voltage

↓ = negative voltage



# HOW TO MAKE A small CONDENSER MIC

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mic capsules available from  
Digi-Key: Part # P-9932  
call 1-800-DIG-IKEY

small microphone  
capsule--others  
also available

35 mm. plastic film can for wire,  
2 electronic parts, and 3 to 9 volt  
battery to power mic capsule

shielded wire  
[ca. 3m. long]

phone or RCA plug

shielded wire  
[ca 4 cm. long]

twist the shield  
wire tightly

strip shielded wire  
about 6-8mm

strip inside or hot  
wire about 2 mm

bottom view of mic capsule  
showing the 2 solder pools

the side with tab  
is the ground

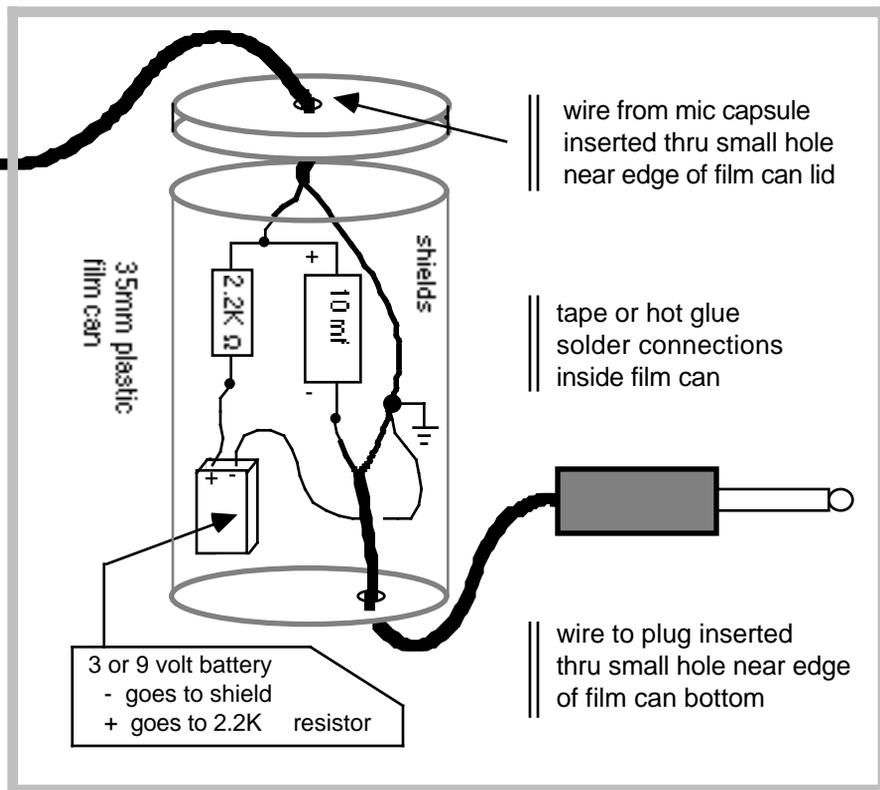


side without tab is  
both the audio and  
battery connection

and, this is about 4 times life-size

## Soldering Details

- Tin both shield wire and hot wire, then cut to same length
- Carefully heat solder pool for the hot wire on the mic capsule and insert hot wire--allow to cool
- Carefully heat solder pool for the ground, and insert shield wire--allow to cool
- Apply hot glue or epoxy around mic capsule and wire



# 6 In 4 Out Matrix Mixer

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