Building   The Piezo Loudenator kit
and   from Jackson Harbor Press
Using: a low power amplifier for piezo sounders

Piezo sounders are often used in battery powered ham radio kits to provide Morse code output. One of the chief virtues of the piezo is low power operation. Unlike a dynamic speaker the piezo has no DC load on a circuit. However piezos also have drawbacks, one that this kit addresses is low volume, especially when operated with 3 or 5 volt kits. The Piezo Loudenator kit uses two CMOS inverters to drive a piezo in a bridge configuration at a supply voltage of up to 18 volts. This results in a noticeable inrease in volume. Note that unless the Piezo Loudenator is connected to another circuit it won't emit any sound other than a possible click when energized.

General notes about building: The components should be inserted a few at a time, soldered in place and then the leads are clipped. The pads and traces are small and delicate - a small tipped, low power (25 watts or less) soldering iron should be used.

The integrated circuit (U1) is a CMOS device. This means that it should be handled as little as possible to prevent static damage. The builder should use a grounding strap and anti-static mat if available or at the very least, work on a grounded metal surface and be sure to touch ground prior to touching the IC.

Building the kit - Step 1) Get the parts together: All of the necessary board mounted components have been supplied. You will still have to provide off-board items from the stocklist to fully implement the kit including the enclosure, jack, battery holder, piezo transducer and mounting hardware. Be sure to get the piezo transducer that requires external drive - basically a very high impedance speaker.

Step 2) Identify and orient the components: The components should be easy to identify and place. The .1 uF monolithic ceramic bypass capacitor is a small yellow parts with 2 radial leads spaced .1" apart. You may need a magnifying glass to see the markings on these part. The .1 uF part is marked 104 or .1M.

Step 3) Mount and solder the components on the board: Use the parts placement diagram along with the parts list (back of this manual) for the placement and orientation of the parts.

Start by inserting the IC socket (if purchased) with the small notch towards the left side of the circuit board and then soldering it in place. There is a 1 on the top of the circuit board at the left side of the IC position. If the socket wasn't purchased, insert the IC directly onto the board with the notch to the left of the board – double check the orientation with the parts placement diagram before soldering !

Then insert the three remaining components at the positions shown on the parts placement diagram. Be sure to solder all the connections and clip leads.

Step 4) Check your work: Before proceeding, take the time to check the bottom of the board for solder bridges. Use the Bottom view diagram as a guide to visually check for these shorts. It may help to clean the flux from the board and then use a strong light in conjunction with a

magnifying glass to see these problems. After you are convinced that the board is OK and after you have formed the leads of IC U1 to fit in the sockets, insert the IC into the socket, being sure to follow the parts placement diagram for proper orientation (pin 1 indicated by a notch or dimple should be to the left. Now hook up the Piezo transducer (speaker) to the connection points at the top of the board. Also solder the battery power connections to the left side of the board. The input connection can be wired directly to the other circuit or by using a jack.

The piezo of the driving circuit should be removed and the Piezo Loudenator should be connected in its place.

Note that with the Piezo Loudenator connected to the piezo output of another kit it will be possible to hear Morse code being sent even though no power has been connected to the Piezo Loudenator. This is due to "self-power" nature of CMOS, the protection diodes on the CMOS input of the Piezo loudenator will route any positive voltage to the power pin and thus energize the rest of the circuit although faintly.

Next, power up the board and send some Morse code – it should be much LOUDER !

Construction Notes:
The Piezo Loudenator can be mounted either internal to the enclosure of the driving circuit or in a separate box with an input jack and a separate piezo. A nine volt battery will provide good volume – for even more sound use a 13.8 volt supply. Two nine volt batteries in series should probably be avoided since they will probably exceed the maximum specification of the IC which is 18 volts.

Operation: One mod which can be made is to connect a series LED with the positive power supply lead, this will give the user an indication of the supply current being used. However the LED will reduce the volume somewhat, a red LED will have the lowest voltage drop.

Notes:
Pins 1 and 2 of the 4007 IC are left unconnected by design. Normally a CMOS part should have all unused input pins connected to either ground or power. But pins 1 and 2 are in effect output pins, the drain and source of a p-channel MOSFET transistor and thus don't need to be connected to anything.

Please feel free to email with any questions, comments, suggestions or problems with the kit - email to: wb9kzy@wb9kzy.com

Best Regards and thanks for choosing the Piezo Loudenator kit,

Chuck Olson, WB9KZY

Piezo Loudenator Kit Parts List

Qty	Ref	Part Name	Description
1	U1	CD4007	14 pin DIP CMOS inverter / MOSFET array
1			circuit board
1	C1		.1 uf bypass capacitor - multilayer ceramic
1	R1		1 megohm resistor - brown-black-green-gold
1	R2		100K ohm resistor - brown-black-yellow-gold

The following items are *NOT* included with the kit:

1		mono input jack
1		battery holder or snap, 9 Volt or ??

The following items are available as an optional extra with the kit:

1		14 pin socket
1		Large Piezo

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