Parrot Sounding AC Doorbell

OVERVIEW

The Parrot Sounding AC Doorbell is a mains-operated doorbell that produces parrot-like sweet sound without requiring a melody generator IC. The circuit is cheap and easy to construct. The AC mains are fed to the circuit without using any step-down transformer and hence the circuit is not bulky either.

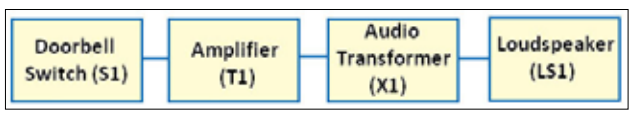


Fig. 1: Block diagram of the Parrot Sounding AC Doorbell

COMPONENT DESCRIPTION

Audio Transformer:

Audio transformers are specifically designed for use in audio circuits. They can be used to block radio frequency interference or the DC component of an audio signal, to split or combine audio signals, or to provide impedance matching between high and low impedance circuits, such as between a high impedance tube (valve) amplifier output and a low impedance loudspeaker, or between a high impedance instrument output and the low impedance input of a mixing console.

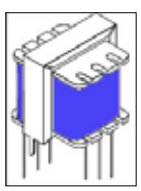


Fig. 2: Construction of an Audio Transformer

Being magnetic devices, audio transformers are susceptible to external magnetic fields such as those generated by AC current-carrying conductors. "Hum" is a term commonly used to describe unwanted signals originating from the "mains" power supply (typically 50 or 60 Hz). Audio transformers used for low-level signals, such as those from microphones, often include shielding to protect against extraneous magnetically coupled signals.

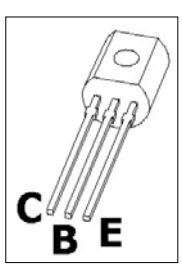


Fig. 3: Pin Configuration of transistor BC337

Transistors (NPN Type BC337):

The BC337 is a general purpose transistors used for switching and amplification purposes. The common-emitter amplifier is designed so that a small change in voltage in (V_{in}) changes the small current through the base of the transistor and the transistor's current amplification combined with the properties of the circuit mean that small swings in V_{in} produce large changes in V_{out}.

From mobile phones to televisions, vast numbers of products include amplifiers for sound reproduction, radio transmission, and signal processing. Modern transistor audio amplifiers of up to a few hundred watts are common and relatively inexpensive.

In the Parrot Sounding AC Doorbell circuitry; this transistors is being basically used for amplification of the audio signal. The amplified signal is available at the collector pin of the BC337 which is input to the loudspeaker for generation of the parrot sound.

Resistors:

The most basic role of resistors is current limiting i.e. precisely controlling the quantity of electrical current that is going to flow through a device or a conductor. Resistors can also be used as voltage divider, in other words they can be used to generate any voltage from an initial **bigger** voltage by dividing it.

Capacitors:

Capacitors store electric charge. They are used with resistors in timing circuits because it takes time for a capacitor to fill with charge. Capacitors are also used to smooth varying DC supplies by acting as a reservoir of charge. They are also used in filter circuits because capacitors easily pass AC (changing) signals but they block DC (constant) signals.

Note: Electrolytic capacitors are polarized and they

PARTS LIST

Semiconductors:

T1	-Transistor BC337
D1	-Diode 1N4007

Resistors (all ¼-watt, ±5% carbon):

R1	-1.5 Kilo-ohm, 5W
R2	-1Kilo-ohm, 1W
R3	-47 Kilo-ohm
R4	-2.2 Kilo-ohm
R5	-3.9 Kilo-ohm

Capacitors:

C1	-0.22µF, Ceramic Disk
C2	-1000µF, 25V Electrolyte
C3	-330µF, 25V Electrolyte
C4, C5	-0.047µF, Ceramic Disk

Miscellaneous:

LS1	- 8 ohm, 0.5 Watt Loudspeaker
X1	- Audio Transformer
S1	- Push-to-On Switch (only meant for prototyping)

Printed Circuit Board (PCB)

Note: Kits 'N' Spares does not provide Doorbell Switch alongwith the components, it is however highly recommended for use in place of the push-to-on switch (S1)

must be connected the correct way round, at least one of their leads will be marked + or -. They are not damaged by heat when soldering.

WORKING PRINCIPLE:

The main components of the Parrot Sounding AC Doorbell circuit are a resistor-capacitor network, transistor BC337 and an audio output transformer X1. The oscillation frequency of the audio signal depends on the combination of resistors R4 and R5 and capacitors C3, C4 and C5. When switch S1 is closed, the audio signal generated due to oscillations is amplified by transistor BC337 and parrot-like sound is reproduced from loudspeaker LS1 connected across the secondary of transformer X1. The audio output transformer (X1) is normally used in transistor radio. The function of the audio output transformer is to transform the high impedance of the output amplifier to match the much lower impedance of the speaker. This is necessary to get an efficient transfer of the audio signal to the speaker. If a wrong audio transformer is used, the result can be low output and loss of tone quality.

The audio frequency tone across the speaker terminal is about 3 kHz. The circuit is powered directly from 220V AC mains. The operating DC voltage obtained at the cathode of diode D1 is about 6V. However, if switch S1 is pressed continuously for a few seconds, the maximum voltage developed at this point may go up to 20 volts, which must be avoided to prolong the life of the circuit. R1 limits surge current in the circuit. The parallel combination of resistor R1 and capacitor C1 limits the circuit current to a safe level for circuit operation. R2 across C1 provides DC path for the current as well as a discharge path when the circuit is switched off. This is to prevent a possible shock to the operator by charged capacitor C1.

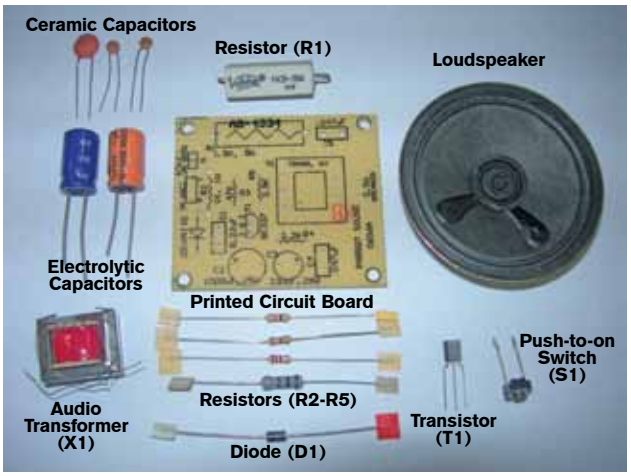
ASSEMBLING THE KIT

Preparing the soldering iron:

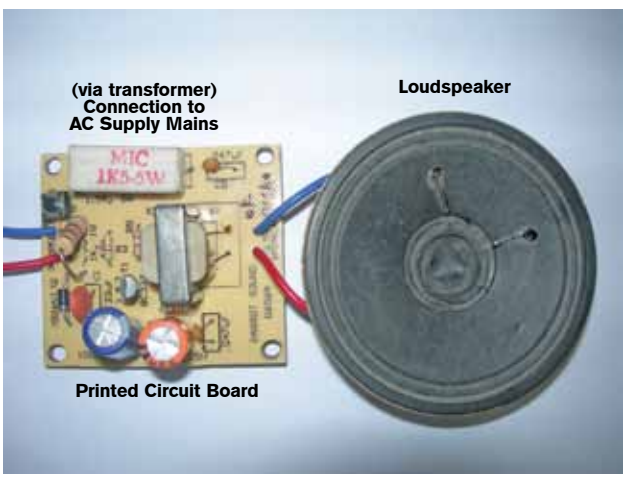
- Place the soldering iron in its stand and plug in. The iron will take a few minutes to reach its operating temperature of about 400°C.
- Dampen the sponge in the stand.
- Wait a few minutes for the soldering iron to warm up. You can check if it is ready by trying to melt a little solder on the tip.
- Wipe the tip of the iron on the damp sponge. This will clean the tip. Melt a little solder on the tip of the iron.

Soldering the components:

- Use the component overlay on the PCB to insert the components and solder them, in the following order:



Component Identification



Completed prototype after assembling the components and soldering

1. Resistors
2. Diodes
3. Capacitors
4. Transistor
5. Doorbell Switch (or Push-to-on switch strictly for testing)
6. Audio Transformer
7. Loudspeaker

- Hold the soldering iron like a pen, near the base of the handle. Touch the soldering iron onto the joint to be made. Make sure it touches both the component lead and the track.
- Hold the tip there for a few seconds and Feed a little solder onto the joint. It should flow smoothly onto the lead and track to form a volcano shape. Apply the solder to the joint, not the iron.
- Remove the solder, then the iron, while keeping the joint still.
- After all the components have been soldered, check the soldering closely for any breaks. Inspect your work carefully under a bright light. The solder

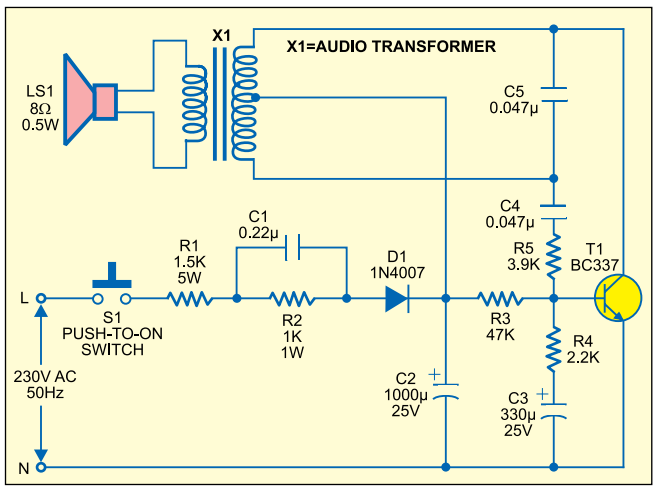


Fig. 4: Circuit Diagram of the Parrot Sounding AC Door Bell

joints should have a 'shiny' look about them. Check that there are no solder bridges between adjacent pads. Connectivity in circuit can be tested by the help of a multi-meter.

Precautions to be taken:

- Please note that the connections to the loudspeaker need to be made externally using wires. Please refer to the pictorial illustration to figure out these connections.
- It is preferable to use multi-thread wires for connection with the loudspeaker, rather than single thread copper wires since they tend to break upon soldering.
- The three-legged transistor should also be carefully placed into the correct drill holes on the PCB.
- Attention must be paid to the polarity of components of such as the electrolytic capacitors and diodes, before soldering them onto the PCB.
- The leads of the audio transformer should be scratched mildly before soldering them into the circuitry, for proper functioning.

Note: For testing/prototyping purposes, a push-to-on switch may be used. However, it is highly recommended to use a doorbell switch (which is used for most commercial doorbells). This is because the Parrot Bell circuit operates on AC supply, which typically cannot be tolerated by a push-to-on switch for too long, without heating up.

A Doorbell Switch

TESTING

- To perform a test on the working of the Parrot Sounding AC Doorbell, plug in the AC supply and switch it ON. Once the circuit is powered, press the push-to-on switch or the doorbell switch. This should cause a sweet parrot-like sound to be generated from the loudspeaker.
- The parrot-like sound should be generated for a preset interval of time which typically lasts about 30 to 40 seconds.

TRY THIS OUT NEXT!

The Parrot Sounding Doorbell discussed here can be modified to generate other sounds/tunes. This can be done by replacing the audio transformer with a different audio transformer. This will alter the sound generated by the loudspeaker. Else, a melody generator IC (like the BT66 or the UM66) can be included in the circuit to generate one's favorite musical tune!

CONTACT DETAILS:

For full range of available kits, take a look at our website: www.kitnspares.com

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