Voice-Activated Tape Recorder Switch

Stop the waste of tape space, and eliminate the need to fast forward through silence, with this voice-activated switch.

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Did you ever have to record a speech, presentation, or conversation and wish that you could do so automatically? It makes no sense to record silence, because that only wastes tape and increases playback time. Some tape recorders come with voice activated recording feature. Unfortunately, not all tape recorders come with that feature.

This article describes a sensitive Voice-Activated Tape-Recorder Switch project. When the project’s circuit detects an audio signal, it provides a closed circuit to a mini plug that can be plugged into the remote jack on a tape recorder. That has the same effect as operating a remote recording switch. With this project and a tape recorder with a remote jack, you can easily add a voice-sensitive recording feature to the setup.
**Circuit Description**

A schematic diagram of the Tape-Recorder Switch is shown in Fig. 1. The circuit can be powered by B1, which is four AA batteries in series, or by any 6-volt DC supply.

Audio signals from the electret microphone, MIC1, are coupled via capacitor C1 to two audio-amplification stages centered around transistors Q1 and Q2. A 5000-ohm potentiometer, R12, provides a sensitivity control that sets the audio level at which the project will activate a tape recorder.

The audio input to the digital switching section of the circuit is biased at half the supply voltage by two 1%, 1-megohm, metal-film resistors (R6 and R7). Integrated-circuit U1 is a 74HC14 hex Schmitt trigger inverter. With a 6-volt power supply, the Schmitt inverter gates will have a 1-volt hysteresis gap between 2.2 volts and 3.2 volts. That means that the input to a Schmitt inverter must rise above 3.2 volts for the output to go low, but must fall below 2.2 volts for the output to return to a high.

Now assume that the input to U1-a (pin 1) is held high by an audio signal from the microphone and that the output (pin 2) would be low. That causes capacitor C5 to charge rapidly through diode D2. The low from pin 2 also pulls the input to U1-b (pin 3) low; the output of U1-b (pin 4) would then be high. That resulting high from pin 4 turns on transistor Q1, which then grounds terminal A if S1 is in the “Auto” position. Terminal B is held to ground by S1-b. That has the effect of shorting terminals A and B together, and thus the two conductors of PL1 to which the mini plug is connected.

With S1 in the “Manual” position, both terminals are grounded, thereby keeping the recorder turned on, regardless of the presence of audio.

The low on pin 3 of U1-b in the presence of audio signal is presented to pin 11 of U1-e and ends up at pin 8 of U1-d. That will pull pin 1 low in the absence of an audio signal from the microphone, making pin 2 high.

Diode D2 blocks the discharging of C5 through its original charging path, so C5 starts to discharge through R9 with a time constant of R9 by C5, or about 10.3 seconds. The turn-off time is determined by the relative turn-on voltage of the Schmitt inverter, which is about half of the supply voltage. That time works out to a delay of about 6 seconds. After that delay, the voltage at pin 3 rises above 3.2 volts, causing pin 4 to go low, thus removing the connection from terminal A to ground, and turning off the tape recorder. A continuous audio input to pin 1 will hold pin 4 high, but as soon as it ceases, the time-out process begins.

When power is applied to the circuit using switch S2, LED lights. However, if the ground connection to R11 is removed, and that end of the resistor is then connected to terminal X (pin 6 of U1-c), the LED will instead light only when the output of the circuit is active (more on that later).
Construction and Checkout

The author's prototype for the Tape-Recorder Switch was built on a small PC board. You can build the circuit on a perforated construction board instead, but a PC board makes the project more compact. A pre-etched and drilled PC board is available as part of a complete kit of parts from the source mentioned in the Parts List. If you would like to etch your own PC board, a foil pattern is provided in Fig. 2.

For those using a PC board, a parts-placement diagram is shown in Fig. 3. Begin assembly by mounting an IC socket for U1 (double-check the orientation with the parts-placement diagram). Then go on to install the fixed resistors; the board is small in size so the resistors must be mounted vertically.

If resistor R11 is installed as shown in Fig. 3, LED1 will light when power is applied to the circuit, as mentioned before. However, again as mentioned earlier, if the ground connection to R11 is lifted, and that end of the resistor is then jumpered to pad X (as indicated by the dashed line), the LED will light when the output of the circuit is active. You might want to go with that option because it makes the circuit's sensitivity a little easier to adjust, and prevents the LED from wasting power.

Continue the assembly process by soldering the capacitors to the board. Check the polarity of the electrolytic capacitors. Then mount the transistors, diodes, and LED. While the two devices, mentioned in the Parts List as suitable for Q3, both are functionally equivalent but they are housed in different packages. Hence, if you use the second device mentioned, a NTE123AF, it will have to be rotated 180 degrees prior to installation.

Next, install the electret microphone, MIC1; check the parts-placement diagram for proper orientation. The unit's negative lead is the one that is grounded to its metal case. Due to the small size of the PC board, and depending on the microphone you use, the leads might have to be inserted and soldered from the bottom side of the board with the microphone bent up over the edge of the board.
side of the board and the microphone bent up over the edge of the board. Otherwise the microphone might physically interfere with the capacitor next to it. Alternatively, you can connect the microphone to the board with a short length of shielded cable.

Go on to install a four-AA-cell battery holder to the board, as shown in Fig. 3. Then use a length of 2-conductor wire to connect to the board a 2.50-mm plug (PL1). PL1 plugs into the remote jack of a tape recorder (the polarity of the plug is unimportant). Finally, insert the IC into its socket to complete the construction process.

Now it is time to checkout and adjust the project. After carefully inspecting the board for soldering errors, install four A4 batteries or connect a 6-volt power supply and turn on power. Connect plug PL1 to the remote jack of a tape recorder and set to record. Any noise should activate the circuit, and adjusting R12 will vary its sensitivity.

Assuming all is well, the circuit is now ready to control a tape recorder. With the Voice-Activated Tape-Recorder Switch, you can enjoy remote audio recording without having to worry about taping the annoying sounds of silence.

PARTS LIST FOR THE VOICE-ACTIVATED TAPE-RECORDER SWITCH

**SEMICONDUCTORS**
UI—74HC14 hex Schmitt trigger inverter, integrated circuit
Q1, Q2—BC547, NTE123A, or equivalent NPN transistor
Q3—BC338, NTE123AP, or equivalent NPN transistor (see text)
D1, D2—1N4148 silicon diode
LED1—Light-emitting diode, any color

**RESISTORS**
(All fixed resistors are 1/4-watt, 5% units, unless otherwise noted.)
R1—47,000-ohm
R2—10,000-ohm
R3—1-Megohm
R4—2.2-Megohm
R5—3900-ohm
R6, R7—1-megohm, 1/4-watt, 1%, metal-film
R8, R9—470,000-ohm
R10—470-ohm
R11—1000-ohm
R12—5000-ohm, PC-mount potentiometer

**CAPACITORS**
C1, C4—0.022-mF, Mylar
C2, C3—0.1-mF, ceramic-disc
C5—22-mF, 16-WVDC, electrolytic
C6—47-mF, 16-WVDC, electrolytic

**ADDITIONAL PARTS AND MATERIALS**
MIC1—Electret microphone
PL1—2.5-mm mini plug
S1—DPDT, PC-mount switch
S2—SPDT, PC-mount switch
B1—6-volt battery (4 AA cells in series)
Printed-circuit materials, 4-AA cell battery holder, 2-conductor cable, solder, hardware, etc.

**Note:** The following is available from Marlin P. Jones & Associates, Inc.
P.O. Box 12685
Lake Park, FL 33403-0685
Tel. 800-OK 2-ORDER or 407-848-8236; Fax: 407-844-8764
VoiceActivated Tape-Recorder Switch Kit (#6013-KT—includes everything specified in the Parts List except batteries), $12.95 plus $3.00 shipping and handling. Florida residents please add appropriate sales tax.