Glolab

Talking Phone Dial Monitor

*Introduction*_____

The Talking Phone Dial Monitor detects the tones generated when numbers are dialed on your touch tone telephone and speaks the numbers that were dialed. This verifies that you dialed the correct number and is especially useful when the keypad is not well lighted or if the person dialing cannot see the keypad well for any reason. The numbers that are spoken can be pre-recorded by speaking into a built-in microphone and can be re-recorded at any time if desired.

*How it works*_____

Description

This design makes use of an integrated circuit made by Information Storage Devices that stores spoken words in memory cells as analog data. Voice can be stored by speaking into an electret microphone connected directly to the IC. It also has a built-in audio amplifier that directly drives a speaker. Figure 1 is a schematic of the talking monitor. The telephone line is connected to the circuits through capacitor C1 and transformer T1 which isolate the line from the circuits. A dual tone multi frequency (DTMF) decoder IC1 decodes the tones generated by your telephone when a number is dialed. The decoded tones appear at the output pins of IC1 as binary information which is fed into a first in, first out (FIFO) memory circuit IC2.

This memory works as a buffer to store the numbers that are dialed so the corresponding words can be spoken slower than the number is dialed. This is especially useful if the number is stored in your telephone and you press a dial or redial redial button which dials the number very fast. The output of IC2 feeds into voice message storage device IC3 that responds to the binary information by speaking its corresponding pre-recorded message.

After each number is spoken IC3 generates an end of message pulse that is sent back to IC2 to tell it that IC3 is ready to speak the next stored number. The words that are to be spoken can be stored in the voice message device at binary address locations selected by DIP switch SA. To record a number you press pushbutton switch SB which is a non-tactile soft touch switch to avoid generating mechanical noise that would be picked up by the microphone located on the circuit board near the switch.

Operation

Capacitor C1 must have a voltage rating of 250 volts to withstand the high voltage produced by a ring signal. On the secondary side of T1, zener diode D1 clamps any high voltage spikes in both the positive and negative direction that might otherwise damage MC145436A touch tone decoder IC1. Resistor R1 and 3.58 Mhz crystal XTAL together with an on-chip oscillator generate clock pulses necessary to the operation of IC1. Data valid (DV) pin 12 goes high when tones are decoded and valid binary data appears at output pins 2, 1, 14 and 13.

DV connects to shift in (SI) pin 3 of the IDT72401L10P FIFO IC2 and increments its address pointer when new data is ready to be stored. Output pins 13, 12, 11 and 10 connect through 10K resistors to the address input pins of ISD1420 voice message storage device IC3.

These address pins can also be manually selected by DIP switch SA to record voice at any of the twelve available storage locations. All DIP switch positions, 1, 2, 3 and 4 must remain open during playback operation of the monitor.

When the FIFO memory IC2 is empty, before a telephone key is pressed, it goes into a flow through mode allowing the first data entered to flow directly to its output. When this happens, output ready (OR) pin 14 momentarily goes up. OR feeds into inverter transistor Q1 and then into IC3 pin 24 triggering a speech sequence.

After a number is spoken and the speech sequence is completed IC3 generates an end of message (EOM) pulse at pin 25 that feeds back into inverter transistor Q2 and into shift out (SO) pin 15 of IC2. This pulse at SO tells the FIFO to send the next binary data and also another OR pulse to IC3. This process continues until all numbers that have been dialed are spoken and the FIFO is again empty. The FIFO has a capacity of 64 X 4 bits which is far more than would ever be needed by even the longest phone number dialed. R7 and C4 perform an IC2 power-on reset to set both write and read address pointers to zero when the circuit is powered up, indicating that the FIFO memory is empty.

A digit is recorded by setting SA according to table 1, pressing push button SB and speaking into the microphone. The record time available for each spoken digit is limited to 1 second to simplify addressing. You must release your finger from SB before this time has expired or the message will flow into the next address space. If this happens the end of the message will be cut off when you record the next message so just try again until all messages sound good. One second allows plenty of time to speak a digit. An LED connected to IC3 pin 25 indicates that a recording is in progress.

Construction

PC Board

Construction is non-critical but bypass capacitors should be placed close to the power supply pins of the ICs. The PC board is single sided making it easy to build your own. A downloadable file containing board artwork that can be printed is available at glolab.com/pcboards/etch.html. Sockets are used for all of the DIP ICs. To assemble the board mount all of the small components first, then add the sockets, microphone, transformer T1, larger capacitors and IC4. Be sure to install the microphone with the correct polarity.

Plug the ICs into their sockets in the correct direction being careful to handle them as static sensitive devices.

After all components are installed connect and solder wires to the speaker, mute switch SC and to the PC board holes marked SPEAKER. Connect the wall transformer leads to the holes marked + and - on the board near C12. Connect the positive lead with the white tracer to the + hole. Connect the red and green leads of a length of flat four conductor telephone wire with an RJ11 plug at one end to the PC board holes marked L1 and L2.

An enclosure should be used to house the speaker and PC board. Cut a 2½ inch hole for the speaker and use perforated metal for a grille. Drill small holes in the side of the enclosure for the power and phone wires. Put a cable tie on the transformer wire and another on the phone wire for strain relief. Leave appropriate slack and pull them very tight so they won't slip along the wires. Mount the PC board using the 6-32 holes provided in the corners of the board.

Testing

Plug the wall transformer into an AC outlet and check to see if you have +5 volts on the circuits. Recording must be done with the enclosure open since you must have access to the microphone and pysh button SB, both of which are mounted on the PC board.

Set switch SA for digit 1 as shown in table 1. Press push button SB gently to avoid mechanical noise, immediately speak "ONE" and immediately but gently release SB. The LED will light while recording is active. Set SA for digit 2 and repeat the above speaking "TWO". Repeat for all digits and the * and # shown in table 1. Turn all SA switches 1-4 OFF after recording all digits. Plug the RJ11 plug into a phone jack and dial each number on your telephone. The monitor should speak the numbers as dialed.

If the recordings do not sound the way you want them to, try recording them again but the wall transformer must be removed from the AC outlet for ten seconds to reset and empty memory IC2 before you can record again.

After dialing, turn mute switch SC off to avoid having numbers talk as you speak into the telephone. This condition called “talk-off” sometimes occurs when speach contains frequencies similar to DTMF tones.

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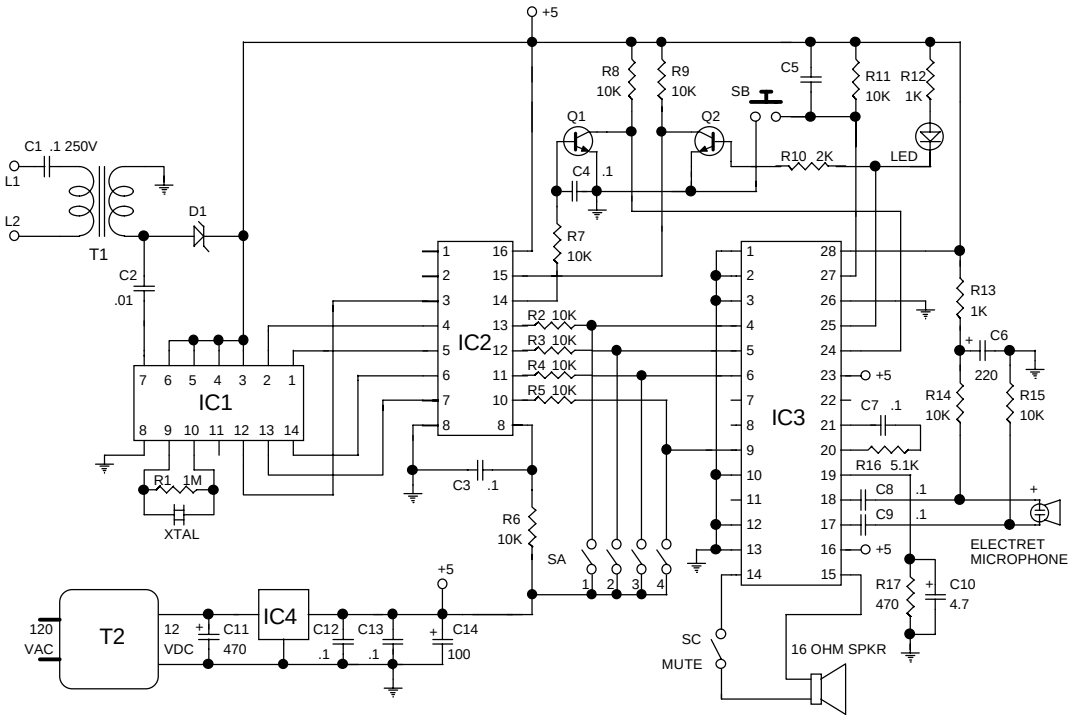
kdial



TALKING PHONE DIAL MONITOR

FIGURE 1

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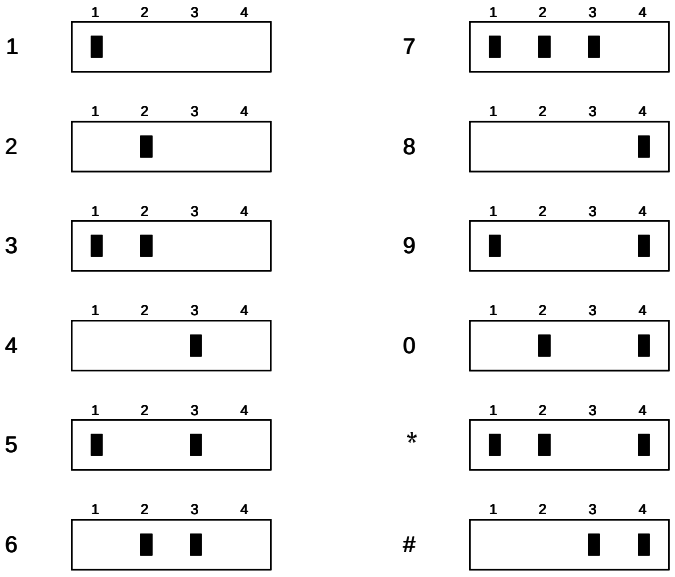
GLOLAB CO
134 Van Voo
Project
Size C
Date 2/1

GLOLAB CORPORATION

Talking Phone Dial Monitor

SWITCH SA



Dip switch settings for recording
black denotes switch ON

TABLE 1

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Talking Phone Dial Monitor

Parts List

Talking Phone Dial Monitor
R1 - 1 MEG 1/8 watt 5%
R2, R3, R4, R5, R6, R7, R8, R9, R11, R14, R15 - 10K 1/8 watt 5%
R10 - 2K 1/8 watt 5%
R12, R13 - 1K 1/8 watt 5%
R16 - 5.1K 1/8 watt 5%
R17 - 0.47K 1/8 watt 5%
C1 - .1 MFD 250 volt metalized film
C2 - .01 MFD 50 volt metalized film
C3, C4, C7, C8, C9, C12, C13 - .1 MFD 50 volt metalized film
C5 - .001 MFD 50 volt metalized film
C6 - 220 MFD 6.3 volt electrolytic
C10 - 4.7 MFD 16 volt electrolytic
C11 - 470 MFD 25 volt electrolytic
C14 - 100 MFD 16 volt electrolytic
D1 - 9.1 volt 1 watt zener
LED - T1¾ light emitting diode
Q1, Q2 - 22222 NPN transistor
IC1 - MC145436 DTMF decoder
IC2 - IDT72401L10P FIFO memory
IC3 - ISD1416 voice message storage device
IC4 - National 7805T 5 volt 1 amp regulator
SA - 4 position DIP switch
SB - non-tactile normally open pushbutton switch
SC - SPST toggle switch
IC socket 14 pin
IC socket 16 pin
IC socket 28 pin
T1 - 600 ohm to 600 ohm telephone coupling transformer
XTAL 3.58 MHz color burst crystal
Electret microphone
Speaker - 16 ohm voice coil
6 FT 4 conductor flat telephone wire with RJ11 plug
T2 - 12 volt 200 MA DC wall transformer
Enclosure - 3” X 4” X 6”
Circuit board - Glolab BDIAL

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