Special Project 8: Audio output of Dual Tone Multiple Frequency for Touch- tone Dialing

Background: Older telephones with rotary switches for dialing basically counted "clicks" as the dial returned to its normal position in order to determine which number was dialed. Touch-tone telephones encode each of the 12 keys on the keypad with two tones determined by the row and column of the key. The tones are defined as:

		High Tone		
Low Tone		1209 Hz	1336 Hz	1477 Hz
697 Hz		1	2	3
770 Hz		4	5	6
852 Hz		7	8	9
941 Hz		*	0	#

The minimum duration for a digit is 50 msec and the minimum time between digits is 45 msec.

Other signaling tones are defined as follows:

Ringing Tone	350 Hz and 440 Hz
Busy Signal	480 Hz and 620 Hz with 60 interruptions per minute (50% duty cycle)
Ringing Signal Tone	440 Hz and 480 Hz with 2 sec. on and 4 sec. off
Caller ID	1200 bits/sec FSK signal between first and second rings using Bell 202 modem standard (1200 Hz Mark and 2200 Hz Space - half duplex - see project A3)

Operation: The user will enter a sequence of seven digits separated by spaces for the phone number. Prior to entering the digit sequence, the user will specify the duration of a single digit.

Using the Sound Card: Sound(Y,FS) where Y is a vector of values, and FS is the sampling rate. Values must be less than +/-1 or they will be clipped

Use A Sampling rate be 10000 samples/second which means that the time between samples is 0.1 ms (0.0001) second.

Design: The program will include the following basic modules:

1. Main program: m-file:
   - This m-file will execute another m-file which gets the set up information from the user, requests the input of the digits, gets the relationship between the digits and the two tones, and creates the output waveform by creating the waveform for each digit and concatenating them to form the complete output. The time between tones should be greater than the minimum required.
2. An m-file is needed to get the duration of each digit. This should be checked to make sure it exceed the minimum value and an upper limit of 1 second should be enforced.
3. A function is needed to ask the user to input the telephone number as text or space separated numeric data. For each digit the corresponding set of two frequencies should be established. The input should be checked for out of range numbers, and the user should be informed and asked if the entered number should be dialed with the incorrect digits omitted. (For numeric input, this would exclude non integer values or values > 9 or < 0. For text input it would be limited to the 12 buttons on the phone. See optional extensions.)
4. A function is needed to find the two frequencies associated with a number and create the output waveform consisting of the two frequencies. Outputs from this function are concatenated (with appropriate spacing between digits) to form the complete output waveform, which is the input for the sound function.
5. Try your dialer using the sound card and listen to the tones
6. Implement the ringing tone and busy signal

Report: In addition to the general requirements include a plot of the outputs for '1', '3', '*', and '#'. , Include plots of ringing tone and busy signal.