

HEARm Testing Procedure

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In this document, I describe how to test the HEARm for correct functionality.

Load Code onto Device (OPTIONAL)

The code is already on the device, but if you like, you can load it again to make sure it is my code.

- 1) Plug in the device to the pc via USB. Make sure you are plugging into the USB port on the STM board, not the P24 board.
- 2) Open my project directory. Run clean_project.bat, and then make_project.bat.
- 3) Open up the Keil uVision IDE, and load the code onto the board (there may be alternative programs for loading the code).
- 4) Replug the device.

Test Device Functionality

- 1) Plug the device into your computer via USB (you can use the port on the STM board or the P24 board in order to power it). The numerical display should be all zeros, with no single LEDs illuminated.
- 2) Press all the switches except for switch nine and ten. Turn the rotary encoder. They should have no effect.
- 3) Press switch nine. The top left LED should now be illuminated. The screen should be display the default frequency, 0125. This satisfies (1) on te project spec.
- 4) Press the bottom-most switch below a number to decrement it, and the top-most switch below a number to increment it. Test this for all the digits, making sure that 9 wraps around to 0. This satisfies (2) on the project spec.
- 5) Try to set the display to something greater than 8000; it should default to 8000. Try to set it to something lower than 0125; it should default to 0125. You should not be able to go above or below these values, respectively.
- 5) Turn the rotary encoder. It should not do anything.
- 6) Set the frequency value to 1000.
- 7) Press switch 10 to go to intensity mode. You should now see -10 displayed (the default intensity value), and the left middle LED should be displayed to indicate that we are in intensity mode. This satisfies (3) from the project spec.
- 8) Press switches 1 through 8; they should not do anything.
- 9) Turn the rotary encoder clockwise through two detents (don't turn it too slowly). The intensity value

displayed should increase by 5.

10) Turn the rotary encoder counter-clockwise two detents. The intensity should decrease by 5. We have now satisfied (4) from the project spec.

11) Make sure the intensity goes from -10 to 110 and no further.

12) Set the intensity to 10. Press switch twelve to save the current tone.

13) Press switch 10 while in intensity mode. Now the only single LED that should be on is the lower right, and it should be blinking at 3 Hz; this indicates the device is in play mode. Hit switch 10 to go back to normal intensity mode with only the left middle LED on. Then once more toggle the play mode with switch 10. This satisfies requirement (6) in the project spec. (requirement (5) was moved to extra credit, and I did not implement it)

14) Press switch nine to go back to frequency mode. Set the frequency to 2000. Notice that the play mode LED went off because we are no longer in play mode; now, we are in frequency mode, and so the top left frequency LED is on. In other words, play mode only exists as a submode of intensity mode.

15) Press switch ten to go back to intensity mode. The intensity should have reset back to -10, since the frequency changed (another requirement of (3) from the project spec).

16) Change the intensity to 20 with the rotary encoder. Press switch 12 to save the current tone.

17) Repeat steps 13-15, but now set the frequency to 3000 and the intensity to 30 and save the tone.

18) Set the frequency to 4000 and the intensity to 40, but do not save this tone.

19) Now hold switch 11 for about one second, until the display changes. It should now display 30, the intensity of the last tone we saved. We are now in review mode.

20) Press switch 12 to cycle through the three saved tones. Pressing switch nine displays the frequency, switch 10 displays the intensity. Note that tones start over when you get to the end of the list. This satisfies requirement (7) for recording responses. This also satisfies requirement (9) for review mode.

21) Hold switch 11 for about one second to go back to test mode. Note that the previous test tone is still there (intensity 40, frequency 4000).

22) Press switch 11 (don't hold it) to delete the last saved tone. Now hold switch 11 to go back to review mode. You should see that the last tone was deleted, and now all we have is (2000, 20) and (1000, 10). This satisfies requirement (8) for deleting saved tones.

23) Hold down switch 11 for five seconds (from either review mode or test mode). The mode will change and the display with it, but keep holding the switch down; this is expected behavior. After five seconds, the middle right LED will start flashing to indicate the reset warning. Release before ten seconds have passed; everything should be the same. All the tones are still saved in review mode.

24) Now hold down switch 11 again, this time all the way to ten seconds. The reset warning LED should increase in flashing rate from five to ten seconds. Then, the top right LED will illuminate to

indicate resetting, the display will flash zeros a few times, and then settle on all zeros. No single LEDs will be illuminated. We are now back to reset mode. This satisfies requirement (10).

25) Verify that all tones have been deleted. Press switch nine to go to frequency mode and display the default frequency, then hold switch 11 for one second. It should not go to review mode, because there are no saved tones.

A video will also be included, basically going through all of these steps.