

Exercise Sheet 4 - Dynamic Circuit Configuration

In **Exercise Sheet 3**, we connected the piezo buzzer to a pin of the microcontroller, which was used for both driving the buzzer and reading the voltage output while using it as vibrational sensor. In this task, we want to use a separate analog front-end as a sensor element. Therefore, modify your setup from **Exercise Sheet 3** as follows:

1. Connect the buzzer **BUZZER** to the single pole of the relay, i.e. to the pin on **CON4** which can be routed either to the right or to the left output of the relay. Have a look at the circuit diagram. This way, you can use one path of the relay to connect the buzzer to your audio output pin and the other path to connect the buzzer to the analog front-end.
2. Connect the remaining outputs of **CON4** to the input of the analog front-end **DAC_IN** and to a PWM capable output pin of the microcontroller so that melodies can be played. This PWM capable pin will be referenced as **PWM_PIN** in the following.
3. Additionally connect the output of the analog front-end **COMP_OUT** to an interrupt capable pin of the microcontroller. This interrupt capable pin will be referenced as **INTERRUPT_PIN** in the following.
4. Set jumper **JP5** to **VFO**.
5. Connect the control pin **REL_STAT** of the relay to a free GPIO pin of the microcontroller.

Task 1

- a) Modify your code of **Exercise Sheet 3** in a way that you can **intelligently** (with respect to power consumption) switch the buzzer's connector between the input of the analog front-end **DAC_IN** and the audio output **PWM_PIN** with the aid of the relay. Now, use **INTERRUPT_PIN** for capturing the vibration signal and use the **PWM_PIN** to play the melody. You are allowed to delete the code for the push buttons **PB5** and **PB6** and the old readout of the buzzer. However, keep the capability of playing two melodies as we are now using the interrupt triggered front-end for playback. (6 pts.)
- b) In a separate text file elaborate two advantages compared to the readout structure of **Exercise Sheet 3**. (1 pt.)
Describe the signal flow originating from the buzzer through the relais, the analog front-end, the microcontroller and back. In addition, identify significant components and characterize their main functionality. (2 pts.)

Hint:

Note the position of the arrow at jumper **JP5** and the schematic.

Note:

Describe all utilized pin connections in a header section of your source code!

Task 2

Create a file `feedback.txt` with a brief feedback statement, which contains specific problems and issues you experienced while solving the exercise, additional requests, positive remarks and alike. Import this text file `feedback.txt` in your **Code Composer Studio** (CCS) project, so that you can upload it together with your software deliverable. (**1 pt.**)