The Design Methodology:

I will build a device which roughly measures the magnitude of a sound given to it. To do so I used multiple digital sound censors which are adjusted to different DB values. The censors need to be connected to a steady voltage source and to the ground. Both of these are being supplied from the BASYS 3s Pmod ports. the left most pins are Vcc (I like to call it Vdd) and the ins next to them are ground

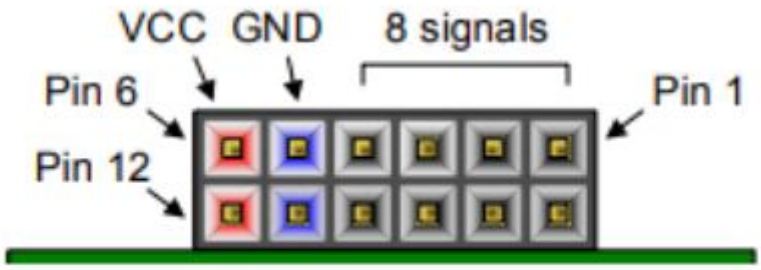
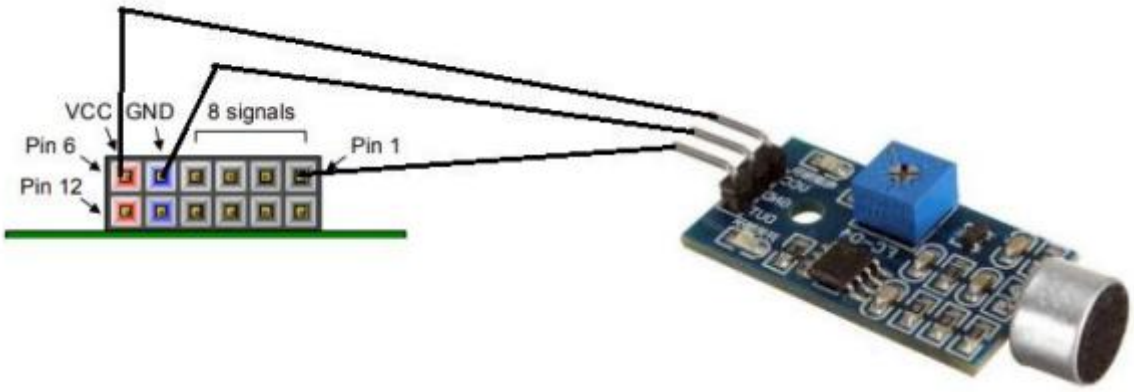


Figure 20. Pmod ports; front view as loaded on PCB.

After that I connected the output of my censors to Pmod ports again.

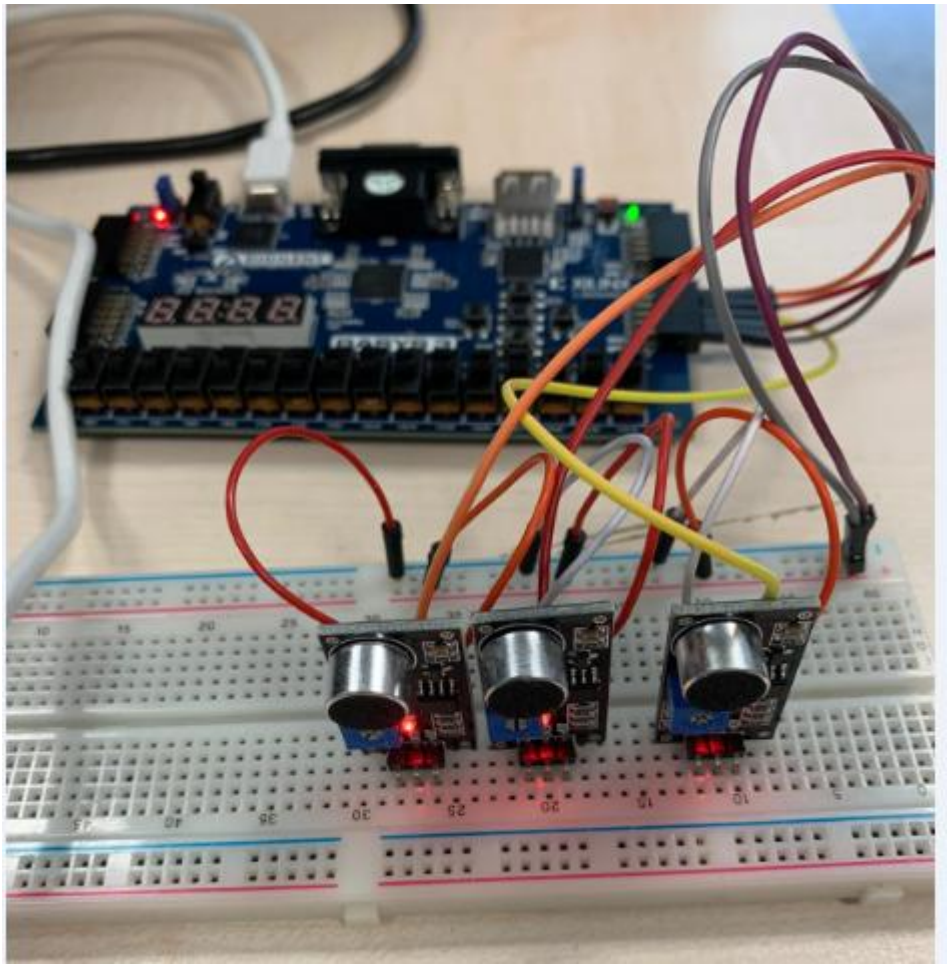


This is a simpler representation of a single censor to the Pmod ports.

In my preliminary report I said I will be connecting 5 censors but I connected only 3 censors because connecting 3 and connecting 5 censors are the same difficulty. Then inside of my BASYS 3 I wrote a VHDL code to connect the inputs from Pmod ports to the leds on the BASYS 3. I connected the inputs to multiple leds corelent to how high its DB value it needs is. So I connected the easiest to activate one 2 led the next one to 3 leds and the hardest one to 5 leds. This gave the device the illusion of a better measurement.

Results:

I connected the Vcc from the BASYS 3 to my breadboard then and created a common Vcc. Then I connected the ground from the BASYS 3 to my breadboard and created a common ground. Then connected my censors to the common ground and common Vcc. Finally I connected the output of my censors to the Pmod ports of my BASYS 3.



This is a picture of my circuit.

Then the code inside my BASYS 3 is extremely simple it is just connects between the leds and the inputs.

VHDL CODE

```
library IEEE;

use IEEE.STD_LOGIC_1164.ALL;
```

```
entity Top_modul is
Port (
      input : in std_logic_vector (2 downto 0);
      LED : out std_logic_vector (9 downto 0));
end Top_modul;

architecture Behavioral of Top_modul is

begin
LED(0) <= input(0);
LED(1) <= input(0);
LED(2) <= input(1);
LED(3) <= input(1);
LED(4) <= input(1);
LED(5) <= input(2);
LED(6) <= input(2);
LED(7) <= input(2);
LED(8) <= input(2);
LED(9) <= input(2);
end Behavioral;
```

constrants

```
# LEDs
set_property PACKAGE_PIN U16 [get_ports {LED[0]}]
```

```
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[0]}]
set_property PACKAGE_PIN E19 [get_ports {LED[1]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[1]}]
set_property PACKAGE_PIN U19 [get_ports {LED[2]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[2]}]
set_property PACKAGE_PIN V19 [get_ports {LED[3]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[3]}]
set_property PACKAGE_PIN W18 [get_ports {LED[4]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[4]}]
set_property PACKAGE_PIN U15 [get_ports {LED[5]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[5]}]
set_property PACKAGE_PIN U14 [get_ports {LED[6]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[6]}]
set_property PACKAGE_PIN V14 [get_ports {LED[7]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[7]}]
set_property PACKAGE_PIN V13 [get_ports {LED[8]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[8]}]
set_property PACKAGE_PIN V3 [get_ports {LED[9]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {LED[9]}]


#Sch name = JC4
set_property PACKAGE_PIN P18 [get_ports {input[0]}]
   set_property IOSTANDARD LVCMOS33 [get_ports {input[0]}]


#Sch name = JC3
```

```
set_property PACKAGE_PIN N17 [get_ports {input[1]}]

   set_property IOSTANDARD LVCMOS33 [get_ports {input[1]}]


#Sch name = JC2

set_property PACKAGE_PIN M18 [get_ports {input[2]}]

   set_property IOSTANDARD LVCMOS33 [get_ports {input[2]}]
```

conclusion:

In this lab we learned connecting external devices to the BASYS 3 and connecting BASYS 3 to external devices. This is really important for everyone's project because almost everyone either connects his BASYS 3 an external device or connects his an external device to BASYS 3. On top of that I made a sound magnitude measuring device which I will use in my final project too. So this was a really important and productive lab for me. Also even if we don't think of the project it is essential for us to make connections between external devices and BASYS 3.

Appendices:

3 Digital sound censors

Breadboard

Bunch of jumper cables