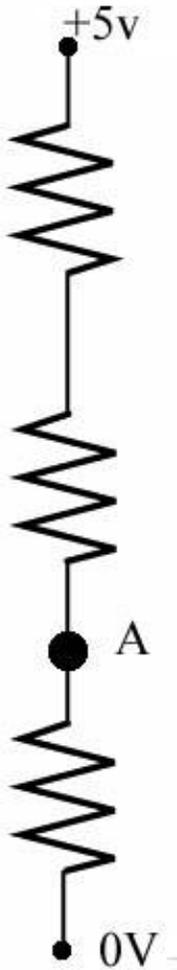


Electronics-Robotics Mid-Year Examination The Fire Alarm Project

1.

Note: IF you are working in groups and under a deadline, it is important for you to be in class and on time each day. You put the group at a disadvantage if you are late or absent. If you are working alone you can continue at home, or anywhere else.



Start with three resistors wired in series as indicated in the schematic diagram to the left. The top resistor and the center resistor MUST be different values.

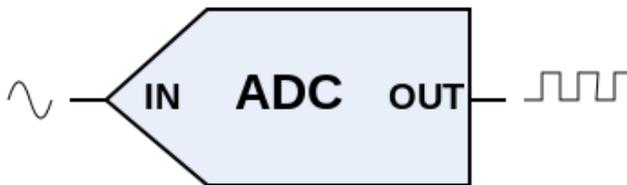
You also will need to wire up a red LED and a green LED. Each of those should have the appropriate resistor in series. You will also need a Piezo Speaker. The speaker does not require a resistor.

Eventually you will also need to have two buttons. One will "Short out" the top resistor. Another will "Short out" the center resistor. The bottom resistor will never be shorted out.

It would be smart to put all those schematics on one piece of paper to which you can refer when you are writing your program, and which you can submit with the program.

2.

You will use an ADC to monitor the voltage at a test point. Variations in voltage will indicate whether the condition of the circuit is normal, trouble, or alarm.



Analog to digital conversion:

Analog-to-digital conversion is the process which is performed by an analog-to-digital converter (**ADC, A/D, A to D, A2D**). It converts a continuous physical quantity (voltage, current, location) to a digital number that represents the amplitude of the quantity.

The conversion always introduces a small amount of error. The ADC will usually “sample” the variable at small time intervals, produce a number representing its magnitude, and then take another sample.

An ADC is defined by its bandwidth (the range of frequencies it can measure) and its signal to noise ratio (how accurately it can measure a signal relative to the noise it introduces).

The inverse operation (Digital to Analog) is performed by a digital-to-analog converter (DAC).

The Activity Board has a 12-bit 4-channel SPI ADC. That means it can accept a signal between 0 and +5 volts and convert it to a 12 bit digital number. (See the TI Spec sheet for the ADC124S021.)

BlocklyProp has two blocks, The first one reads an analog channel and the second supplies an analog channel. They are located in the analog section

A/D channel read (0-5V) in volt-100ths

D/A channel output (0-3.3V) volt-100ths

3.

At this point if you have not yet done so, you should construct the series resistor circuit shown on the first page and determine the voltage reading when the condition is normal, when a wire is broken (trouble), when one button is pushed, and when the other button is pushed. This is an important step! You will need these numbers in order to calibrate the alarm.

“Normal” Voltage (Circuit is set up and there are no buttons pushed) = _____

“Trouble” Voltage (The wire connecting the top resistor to 5V is removed) = _____

“Button 1” Voltage (A wire or button shorts out the top resistor) = _____

“Button 2” Voltage (A wire or button shorts out the second resistor) = _____

The instructor will lead you through the process of converting those voltages to the proper values to be entered into the “decision chain” part of your program.

4.

At this point you need to develop the program.