Research on the Operation of a Trigger Level Circuit Subsystem
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Body:

The information gathered from this research enables the user to adjust the trigger level to detect the signal in a channel. If the signal is not detected then there is a state where no signals are displayed because there is no signal found by the trigger level circuit to be displayed.

The Analog Front End Subsystem outputs filtered and unfiltered signals, which are both scaled appropriately for the voltage constraints of the microcontroller. These signals are sent to the Trigger Level Circuit Subsystem. This subsystem is made of an averaging amplifier and a comparator.

The averaging amplifier is used to average the filtered and unfiltered signals provided by the Analog Front End Subsystem. Averaging these signals helps to reduce distortion on the measured signal while maintaining signal characteristics from the unfiltered signal because the filtered signal could have distorted the signal shape. Our supply voltages to the op amp are 5V and 0V since 5V is already supplied to the microcontroller and we are using less hardware by not providing ±5V supplies. For our averaging stage, we are aiming for a bandwidth of 10MHz and our proposed values for the resistors are in the diagram.

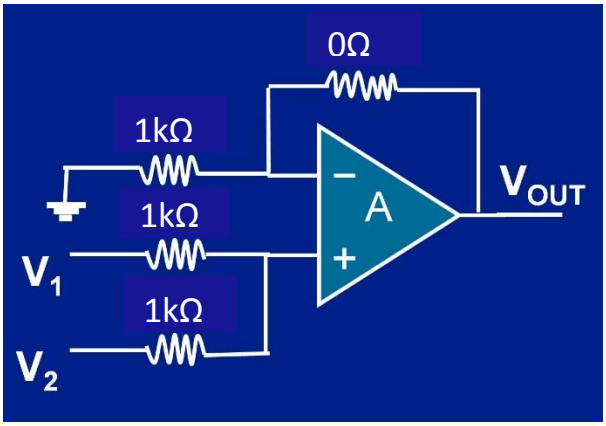

Figure 1: Explanation of a non-inverting summing amplifier and helps to understand the operation of an averaging amplifier. *-Sourced from a Microchip wiki page* [1]

The comparator implements the actual trigger of the Trigger Level Circuit Subsystem. The trigger is controlled by a potentiometer with an external, mechanical control to be used by the operator of the oscilloscope. Outputs of the comparator are either voltage highs of about 3.5V (saturation voltage for the op amp) and lows at 0V. An output of 3.5V allows the microcontroller to see an acknowledgement that the trigger detects a signal. Our supplies to the comparator are also 5V and 0V but our values for the resistors are tentative because of inter-subsystem design constraints, the physical size of the potentiometer which may determine what full resistance the potentiometer can have. The maximum resistance of the potentiometer (would be in the position of R2) should be 2/3 the value of the other resistor to agree with our scaled signals.

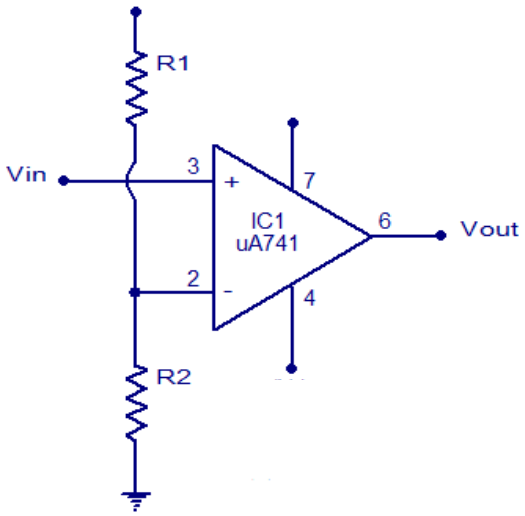

Figure 2: Understanding the operation of a fixed trigger level on a comparator helps to learn function of our trigger level circuit. *-Sourced from Circuits Today* [2]

Annotated Bibliography

[1] Microchip Technology Inc. August 25, 2014. [Online]. Available: http://microchip.wikidot.com/asp0107:non-inverting-summing-amp

This webpage explains the operation of an amplifier that sums signals together which helps to understand the function of an averaging amplifier, a summing amplifier with a gain of 0.5 for the sum of 2 signals.

[2] Circuits Today. November 25, 2011. [Online]. Available: http://www.circuitstoday.com/voltage-comparator

This webpage explains the operation of a comparator circuit with a fixed trigger level which helps to learn the function of a variable trigger circuit.