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ECE 411
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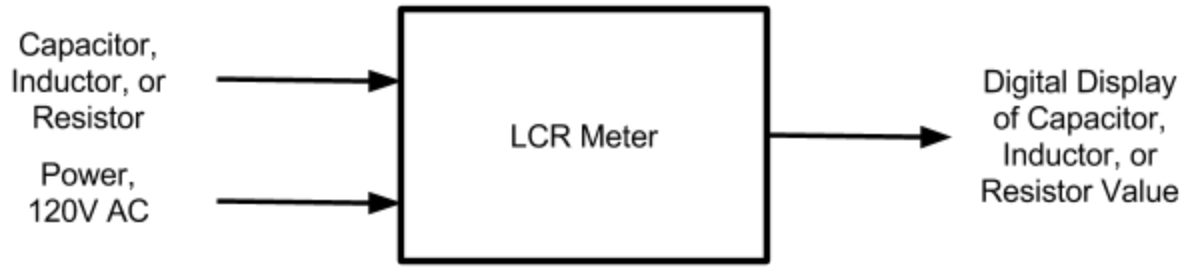
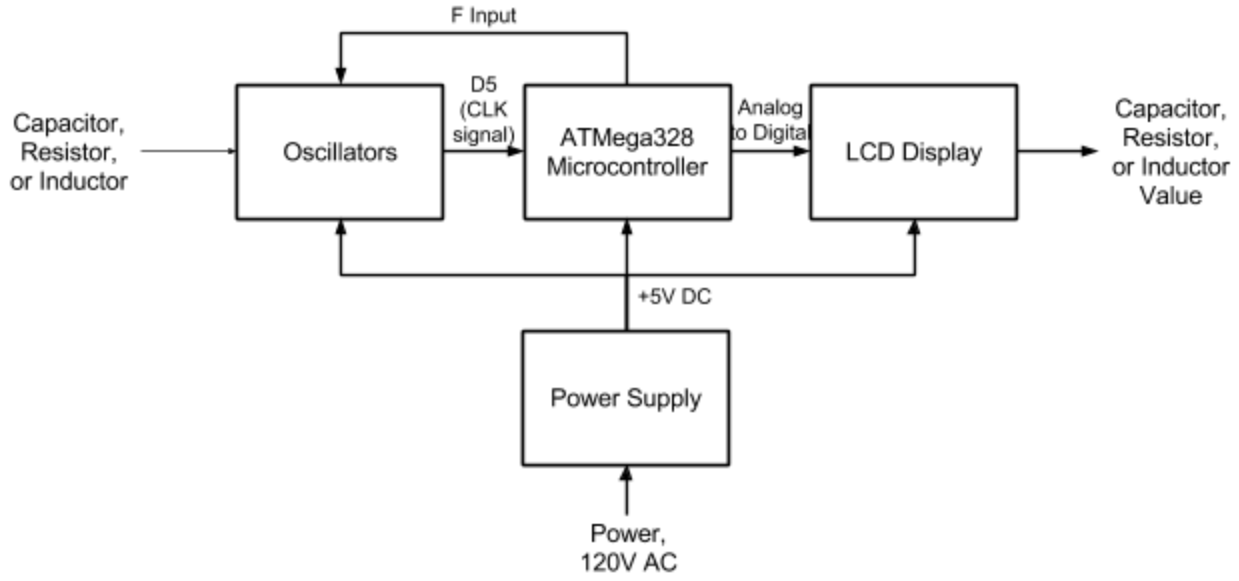
Homework 5: Detailed Design

**Level 0 Block Diagram**

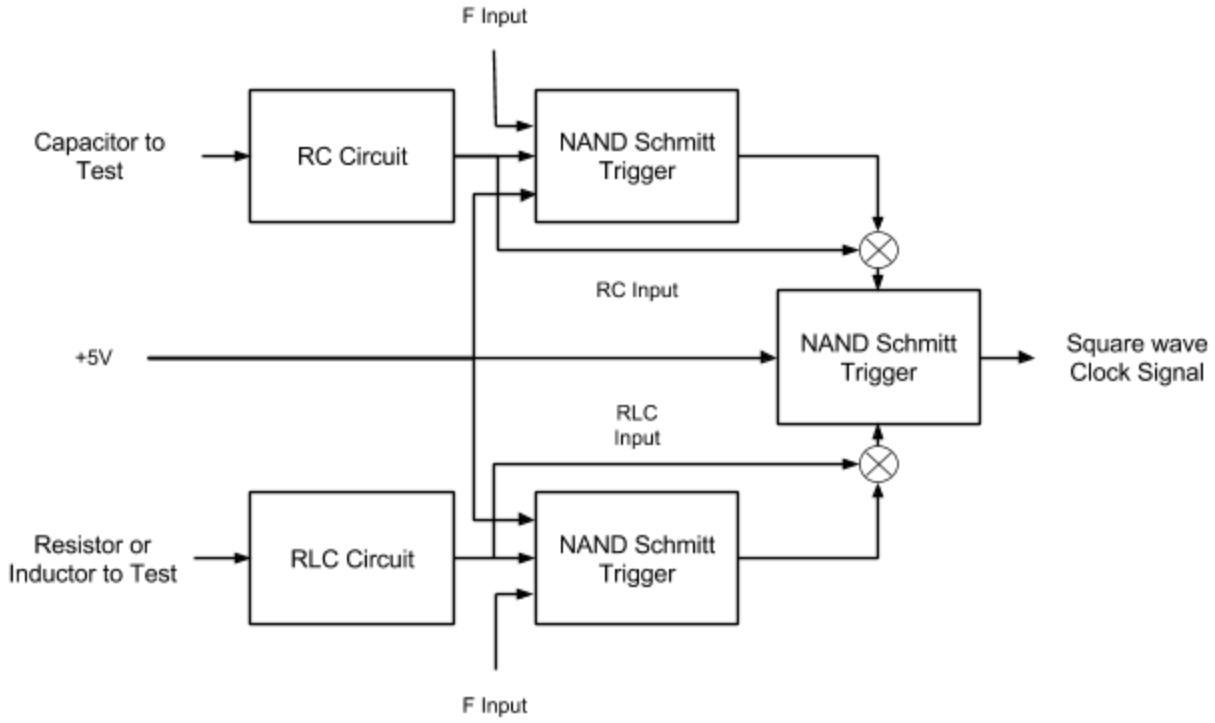



| | |
|---|---|
| *Module* | LCR Meter |
| *Inputs* | ● Capacitor, resistor, or inductor to measure<br>● Power: 4.5 to 5.5V |
| *Outputs* | ● Value of capacitor, resistor, or inductor |
| *Functionality* | Displays the value of a capacitor in Farads, a resistor in Ohms, or an inductor in Henrys on an LCD display screen |

## Level 1 Block Diagram




## Level 2 Block Diagram: Oscillators



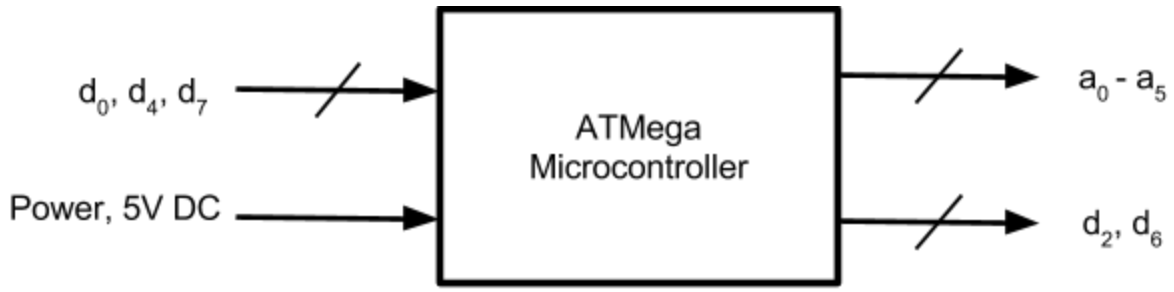
| *Module* | RC Circuit |
|---|---|
| *Inputs* | ● Capacitor to measure |
| *Outputs* | ● Change in impedance from RC circuit |
| *Functionality* | Changes the input to the NAND Schmitt Trigger |

| *Module* | RLC Circuit |
|---|---|
| *Inputs* | ● Resistor or inductor to measure |
| *Outputs* | ● Change in impedance from RLC circuit |
| *Functionality* | Changes the input to the NAND Schmitt Trigger, which changes the output frequency of the NAND Schmitt Trigger |

| *Module* | Inductor Circuitry |
|---|---|
| *Inputs* | ● Inductor to measure<br>● Power: 4.5 to 5.5V |
| *Outputs* | ● Value of capacitor, resistor, or inductor |
| *Functionality* | Changes the input to the NAND Schmitt Trigger, which changes the output frequency of the NAND Schmitt Trigger |

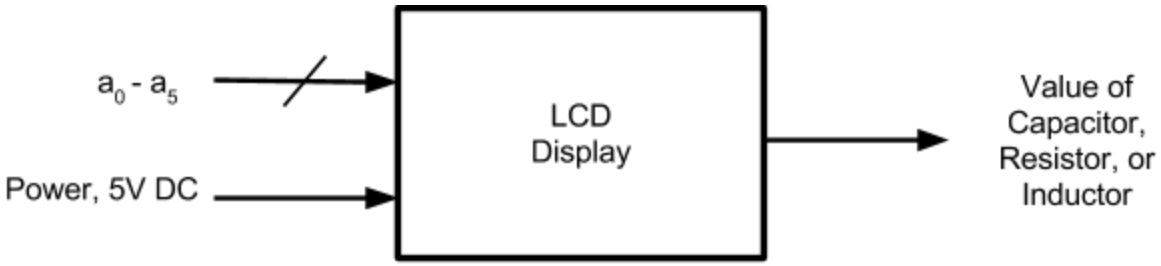
| *Module* | NAND Schmitt Trigger (74HC132) |
|---|---|
| *Inputs* | ● 5V power<br>● F input from ATMega328<br>● RLC input |
| *Outputs* | ● D5(Arduino) |
| *Functionality* | Changes the output frequency to a square wave clock signal |

**Level 2 Block Diagram: ATMega Microcontroller**



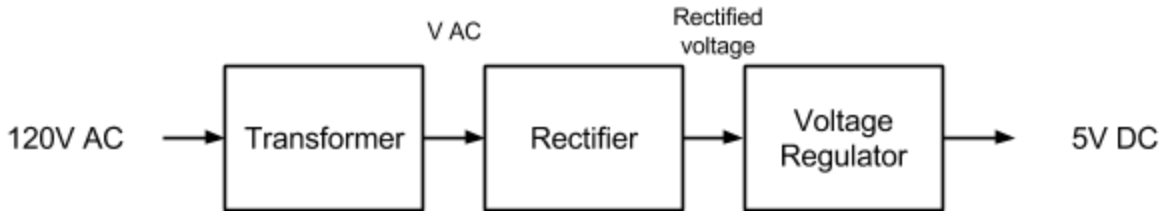

| | |
|---|---|
| *Module* | ATMega Microcontroller |
| *Inputs* | • $d_0$: Digital pin to select mode and positive calibration<br>• $d_4$: Digital pin for negative calibration<br>• $d_7$: Digital pin to set 0<br>• 5V power supply |
| *Outputs* | • $a_0$ - $a_5$: Analog pins to LCD Display Screen<br>• $d_2$, $d_6$: clock signals |
| *Functionality* | Based on change of frequency from digital pins, the Arduino code calculates the resistor, inductor, or capacitor value |

**Level 2 Block Diagram: LCD Display Screen**




| | |
|---|---|
| *Module* | LCD Display |
| *Inputs* | • Power: 4.5 to 5.5V<br>• $a_0$ - $a_5$: Analog pins to LCD Display Screen |
| *Outputs* | • Value of capacitor, resistor, or inductor |
| *Functionality* | Displays the value of a capacitor in Farads, a resistor in Ohms, or an inductor in Henrys on an LCD display screen |

**Level 2 Block Diagram: Power Supply**




| | |
|---|---|
| *Module* | Power Supply |
| *Inputs* | • 120V AC |
| *Outputs* | • 5V DC |
| *Functionality* | Converts the 120V AC from the wall input to 5V DC to power the circuit |