Circuit Calculations for Carboy Cooler

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LEDS

1. Each I/O port on the ATmega16U4/ATmega32U4 can source 20mA at VCC = 5V, 10mA at VCC = 3V under steady state conditions (non-transient).
2. It must also be observed though that for the ATmega16U4/ATmega32U4:
    a. The sum of all IOH, for ports A0-A7, G2, C4-C7 should not exceed 100mA.
    b. The sum of all IOH, for ports C0-C3, G0-G1, D0-D7 should not exceed 100mA.
    c. The sum of all IOH, for ports G3-G5, B0-B7, E0-E7 should not exceed 100mA.
    d. The sum of all IOH, for ports F0-F7 should not exceed 100mA
3. For this reason the current flow accross each LED has been limited to 12mA
    a. White LED:
        i. $5V-3V/165\Omega = 12.1mA$
    b. Blue LED:
        i. $5V-3V/165\Omega = 12mA$
    c. Green LED:
        i. $5V-2V/250\Omega = 12mA$
    d. Red LED:
        i. $5V-2V/250\Omega = 12mA$

Power Consumption

1. The total supply is 5A for the entire circuit
2. The Microcontroller will use 500mA to supply itself and everything it needs to.
3. Microcontroller power supply calculations:
    a. 500mA(Total provided by the UA78M08CDCYR) - 1mA(AM2301B) - 48.2mA(LEDS) - 2.5mA(DHT11) - 22mA(Relay Coil for TEC) - 200mA(Arduino Micro) = 226.3mA as a safety buffer
4. Total circuit power supply calculations:
    a. 4A(Total provided by power supply) - 500mA(Micro power supply) - 160mA(Cooling Fans) - 3.1A(TEC's at maximum) = 240mA as a safety buffer