

Digital Clock Functional Requirements

By Ludis

Overview

To build a personal microcontroller-based digital clock for indoor use to display the day of the week, date, and time. The clock will also control a string of pixel LEDs which is used as background lighting and to alarm, by light display, to indicate the passing hour. The clock will also read and display from a temperature and humidity sensor. The microcontroller such as the parallax P1 or P2 is recommended but not required. The secondary purpose of the digital clock is to learn how to use microcontrollers, programming, and slave component drivers. The requirements of the digital clock can be built based on Parallax/JonnyMac first 4 spin 2 beginner series that are located on youtube. Have fun and be creative!

Requirements

Section 1: Basic Function

1.1 Time shall be indicated in hours and minutes

1.1.1 Time shall be Indicated in Military or Civilian Time (24 hour and 12 hour)

1.1.2 In civilian time AM or PM shall be correctly indicated

1.2 The data shall be indicated in the month, day, and year

1.2.1 The day of the week shall be indicated

1.3 Time shall be counted in second intervals

1.3.1 Count error should be within +/- 0.0001%

1.4 Time shall be kept if electrical power is lost

Guidance: The time logic must continue to count but the LED displays are not required to work

1.4.1 Time counting shall continue from a battery backup for up to 1 day

1.5 At least one pixel LED shall be controlled by the microcontroller for background lighting

1.5.1 At least 50 pixel LEDs per string

1.5.2 The color shall be adjustable by the user

1.5.3 The brightness shall be adjustable by the user

1.5.4 On the hour, a unique light show shall be displayed, to signify the passing of an hour

1.5.5 The pixel LEDs may be turned off

1.6 The clock display shall be LED

1.6.1 The led brightness shall be adjustable

1.6.2 The hour-minute display shall have a ":" LED between the hour and the minute

Digital Clock Functional Requirements

1.6.3 The “:” display shall pulse on/off to signify the passing of time

1.7 The clock shall indicate from the year 2020 to 2099

1.7.1 The clock should account for daylight savings and leap years

1.7.2 The clock shall account for the number of days per month

1.8 The clock shall be display on a desktop or hung on a wall within 5-10 feet of a power source

1.8.1 No more than 3 amps should be drawn with all LEDs at max brightness

1.8.2 The clock shall use a 120VAC, 60hz electrical source

1.9 The clock shall measure temperature and humidity

1.9.1 The temperature and humidity shall be indicated but does not have to be one of the main indications

Section 2 User Interface

2.1 An interface shall be provided to adjust the day of the week, the date, and time

2.1.1 An interface shall be provided to adjust the military time or civilian time indication

2.1.2 When adjusting the day of the week, the date, and the time, the selected parameter shall flash

2.2 An interface shall be provided to adjust the clock brightness

2.2.1 An interface shall be provided to adjust the color of the pixel LEDs

2.2.2 An interface shall be provided to adjust the brightness of the pixel LEDs

2.2.3 An interface shall be provided to show the hourly pixel LED patterns

2.2.4 An interface shall be provided to switch between day of the week, temperature, and humidity

2.3 An interface shall be provided to plug in usb cable to upload new code to the microcontroller

2.3.1 An interface shall be provided to turn the power off or on.