

# ClockOS

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Open Source LED Clocks



## Overview

## Technical

The ClockOS Clocks are made up of 180 RGB leds and a computer that keeps track of time and the sequencing of the leds.

### Programming buttons

On the back side of the clock are 3 buttons that allow the user to select one of 10 saved clock schemes. The clock is pre-programmed with 10 different clock styles. These styles can be changed by the user as described in this manual. The original factory default settings are stored in ROM and can be reloaded by the user using the 3 buttons located on the rear of the clock.

### Software can be modified

Located above the programming buttons is a 6-terminal header post that can be used to re-program the software in the clock using an Arduino development system. This is discussed in more detail in this manual.

### Power

Due to a multiplexing scheme used to drive the leds, the ClockOS board draws less than 30 ma when running. The board will accept a DC voltage from 7-10 VDC. An onboard power supply maintains a 5 volt DC level on the board,

### Care

Your ClockOS has been designed to provide you with many years of enjoyment. To clean the face of your clock, use a damp soft cloth to wipe off any dust or fingerprints .

In the event the wall pack power supply should ever fail, the ideal replacement would be a 9VDC regulated power supply with at least 200 ma of current.

The clock can be run from a standard 9 volt battery, but will drain the battery in approximately 30 hours.

### Included files

We have included the board layout files and all programming files used to create the ClockOS. As a supporter you have full access to these files and have the permission of ClockOS to use these files. We only ask that you give ClockOS credit for the board design and initial software release.

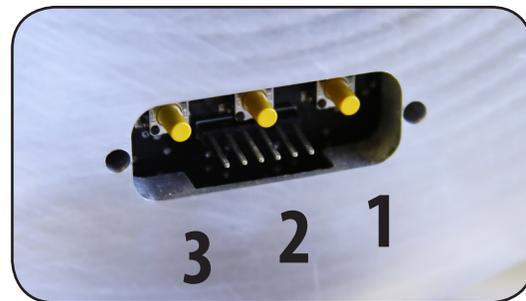
# Selecting Clock Faces

10 different unique styles

The ClockOS will retain 10 different clock style faces enabling you to match your taste and decor. The styles can be selected and modified as many times as you wish, It is also possible to recall the “factory” settings that are permanently saved in ROM on the ClockOS board .

## Selecting a Clock Face

To select a new clock face press the center button and hold until an all leds turn on blue, then release the button. From the 12:00 position to the 2:00 position, 1 to 10 green leds will be illuminated. (see photo below) This indicates the clock face that is currently selected to display. ( If 7 green dots are displayed then this is clock face number 7. )



*View from rear of clock*



*Above photo shows that clock face number 7 will be displayed*

While the green dots are being displayed Button 1 can be pressed to select a clock face that is numbered lower than the current face. Button 3 can be pressed to select a clock face numbered higher than the current clock face. (note: Button 1 or button 3 can be held down to auto increment through the face selections.)

After approximately 3 seconds of no buttons being pressed, the selected clock face will display.

# Selecting Clock Colors

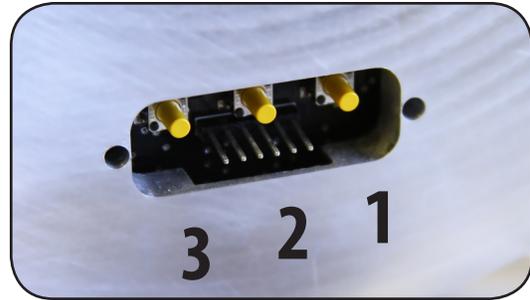
7 different colors

## Overview

The ClockOS contains RGB leds which are chips that contain a red, green and blue led in each chip package. These LEDs can be individually controlled to provide 7 different colors.

The available colors are:

Red  
Green  
Orange  
Blue  
Violet  
Cyan  
White (in theory)



*View from rear of clock*

## Selecting Led Colors

To place the ClockOS into the mode to select colors: Press **button 1** and **button 3** at the same time.

A red band of leds will sweep the clock face indicating you are entering the mode to select led colors.

When the red bands erase and the time changes to 12:07 release the buttons.

This mode allows you to set the color of the leds used to display seconds, minutes, hours, hour markers and pendulum. It is also possible to set the seconds for tracer mode and set the hour pattern leds to one of four different styles:

### Hour Marker Styles:

12:00 hour marker only  
1/4 hour markers only (4 positions)  
All hour markers (12 positions)  
All hour markers off

## Button legend

When in “color set” mode, the following button patterns are used to select the available colors and patterns.

**Button 1** - set the color of the seconds marker and tracer or non-tracer mode

**Button 2** - set the hour hand color

**Button 3** - set the minute hand color

**Button 1 with Button 2** - Set hour marker color and pattern or turn off all hour markers

**Button 2 with Button 3** - Set the pendulum color or turn pendulum function off.

# Selecting Clock Colors continued

**Pressing Button 1** will scroll the seconds through the following colors and patterns:

- 
- Red
  - Green
  - Orange
  - Blue
  - Violet
  - Cyan
  - White
  - Off
  - Red trace mode
  - Green trace mode
  - Orange trace mode
  - Blue trace mode
  - Violet trace mode
  - Cyan trace mode
  - White trace mode
  - Off

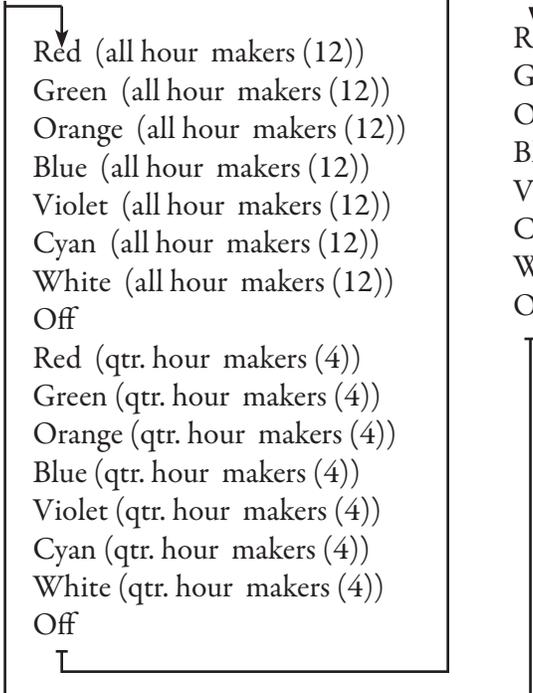
**Pressing Button 2** will scroll the hours through the following colors

- 
- Red
  - Green
  - Orange
  - Blue
  - Violet
  - Cyan
  - White

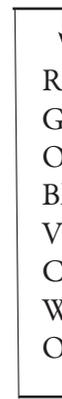
**Pressing Button 3** will scroll the minutes through the following colors

- 
- Red
  - Green
  - Orange
  - Blue
  - Violet
  - Cyan
  - White

**Pressing Button 1 & 2 at the same time** will scroll the hour markers through the following colors and patterns:

- 
- Red (all hour makers (12))
  - Green (all hour makers (12))
  - Orange (all hour makers (12))
  - Blue (all hour makers (12))
  - Violet (all hour makers (12))
  - Cyan (all hour makers (12))
  - White (all hour makers (12))
  - Off
  - Red (qtr. hour makers (4))
  - Green (qtr. hour makers (4))
  - Orange (qtr. hour makers (4))
  - Blue (qtr. hour makers (4))
  - Violet (qtr. hour makers (4))
  - Cyan (qtr. hour makers (4))
  - White (qtr. hour makers (4))
  - Off
  - Red (12:00 hour maker (1))
  - Green (12:00 hour maker (1))
  - Orange (12:00 hour maker (1))
  - Blue (12:00 hour maker (1))
  - Violet (12:00 hour maker (1))
  - Cyan (12:00 hour maker (1))
  - White (12:00 hour maker (1))
  - Off

**Pressing Button 2 & 3** will scroll the pendulum through the following colors

- 
- Red
  - Green
  - Orange
  - Blue
  - Violet
  - Cyan
  - White
  - Off

# Selecting and Saving Clock Faces

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## Overview

The ClockOS allows the user to save 10 different clock face programs. These programs are saved in a EE-prom on the ClockOS printed circuit board and will retain the setting even with power disconnected.

## AutoSave

Whenever the colors for a clock face are changed they are automatically saved to memory.

## Reload Factory Settings

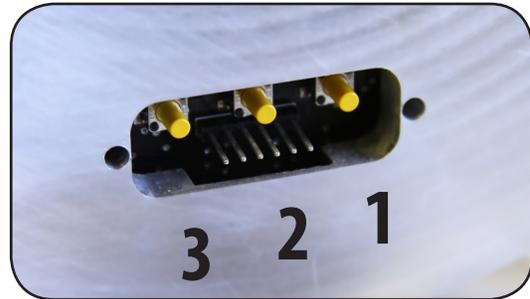
When the ClockOS is shipped from the factory it is pre configured with 10 different clock faces.

These 10 factory settings can be reloaded at anytime by pressing an holding Button 1 & 2 while in clock run mode. Hold the buttons down and the display will start turning a solid blue color. Hold the buttons until all Leds have turned blue and the release.

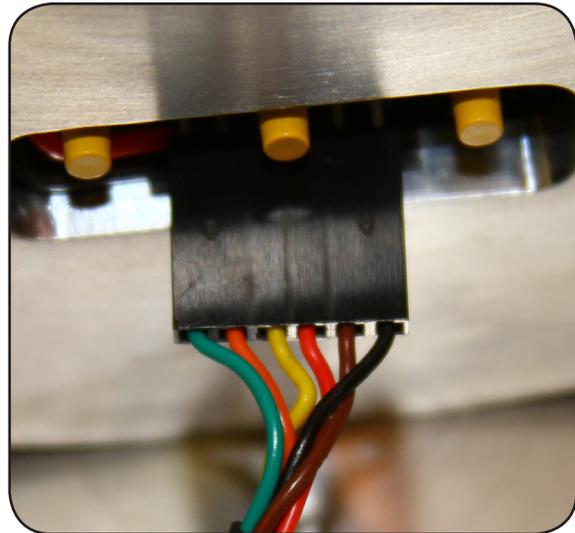
Caution: Performing the factory reset will delete all user settings and cannot be undone. The user clock faces will need to be re-programmed.

Clock Face 10 is a special clock face that puts the seconds, minutes, and hours in tracer mode. the pendulum cannot be turned on in Clock Face number 10.

This reload only loads the color tables for the clock faces. If the program has been altered and uploaded by the user, the factory program will need to be reloaded to return the ClockOS back to factory settings.



*View from rear of clock*



Orient connector as shown when programming the ClockOS board.

# Programming the ClockOS with Arduino Development System

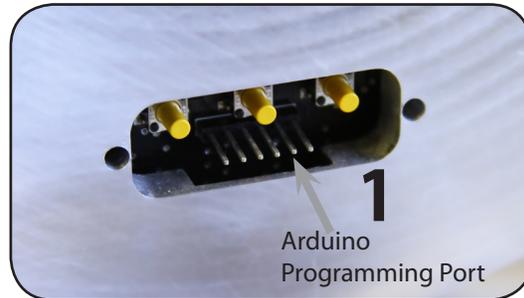
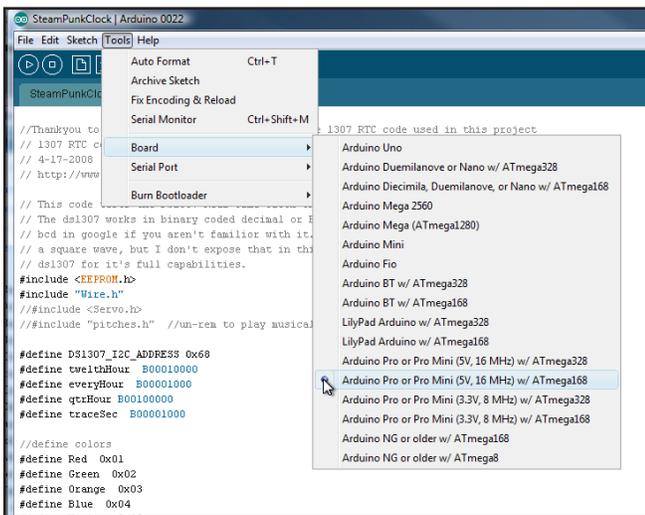
## Overview

The ClockOS software can be programmed using the Arduino Development Software that can be downloaded free from the internet: <http://arduino.cc/>

## Configure

Once the software is downloaded the following selections are used to set the system up for programming.

The ClockOS board looks like an Arduino PRO (5V 16mhz AT168) board to the software. When configuring the Arduino software use the selection as shown in the photo below.



View from rear of clock

Remove the screws that hold the plate over the buttons on the back of the clock.

Plug the connector from your programming system onto the 6 pin connector (green wire to the left most pin) See photo on previous page.

The clock will power up from power on the programming port and does not need the power supply plugged in while programming.

Once the cable is connected, and the Arduino software is configured (you must select the board and the port that the programming cable is connected to), you are ready to start programming the ClockOS.

The original program can always be reloaded to bring the ClockOS back to factory settings.

## Connecting computer to ClockOS

A USB to Serial interface (not included with ClockOS) must be used to connect the ClockOS to a USB port on your computer. FTDI makes a cable with the connector needed that will plug straight into the 6 pin connector located next to the programming buttons on the ClockOS. Digi-Key is a distributor of these cables.



## Loading New Programs

Before a new program can be uploaded to the ClockOS the PIC microprocessor must be put in standby mode to release the RS 232 lines. Press all 3 buttons on the ClockOS at the same time. When the PIC processor goes into standby, only 3 blue leds at the 12:00 position will be on. At this time your new software can be uploaded to the ClockOS. After uploading press Button 1 to bring the PIC processor out of standby mode.

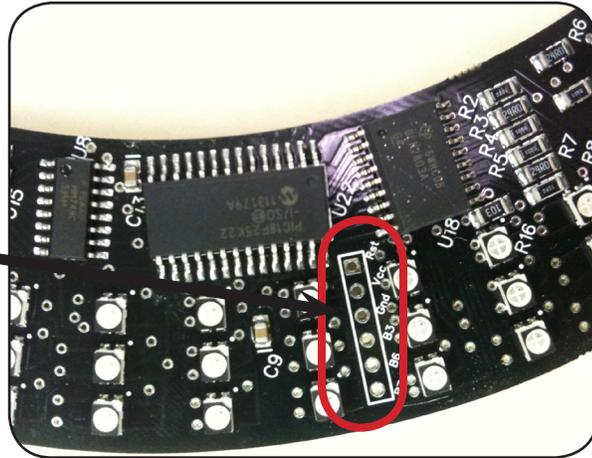
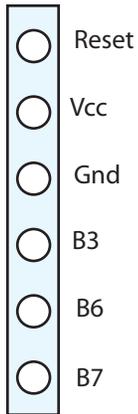
Digi-Key part number.....P/N 768-1028-ND



# Programming the PIC Processor

The PIC processor is set up as a slave processor to the Atmel processor and handles the chore of multiplexing the LEDs.

The processor used is a PIC18F25K22. Located on the board next to the pic processor is a 6-pin programming port that can be used to upload the hex file to the processor. The C code and hex file are included with the ClockOS so that it can be modified to suit your needs.



Pinout for the ICSP port on the PIC18F25K20

A standard 6 pin header post with .100 spacing can be used to program the PIC processor.

The internet contains a lot of information on how to program the PIC using these pins. Most users will only be using the Atmel to program the ClockOS and never use this port. It is made available however for users that wish to make modifications to the PIC processor code.

*Thankyou . . .*

Thank you for supporting ClockOS through the KickStart program. We have received many compliments on our ClockOS design and are looking forward to marketing this clock through other marketing channels. If it had not been for your support we would not have been able to launch this program.

Enjoy your ClockOS, we would love to see any programs you have wrote and hear about what you are doing with your ClockOS.

We know that there are many of you that have programming ideas that we have not even thought of.

Again, many thanks in supporting us.

Adam and Terry