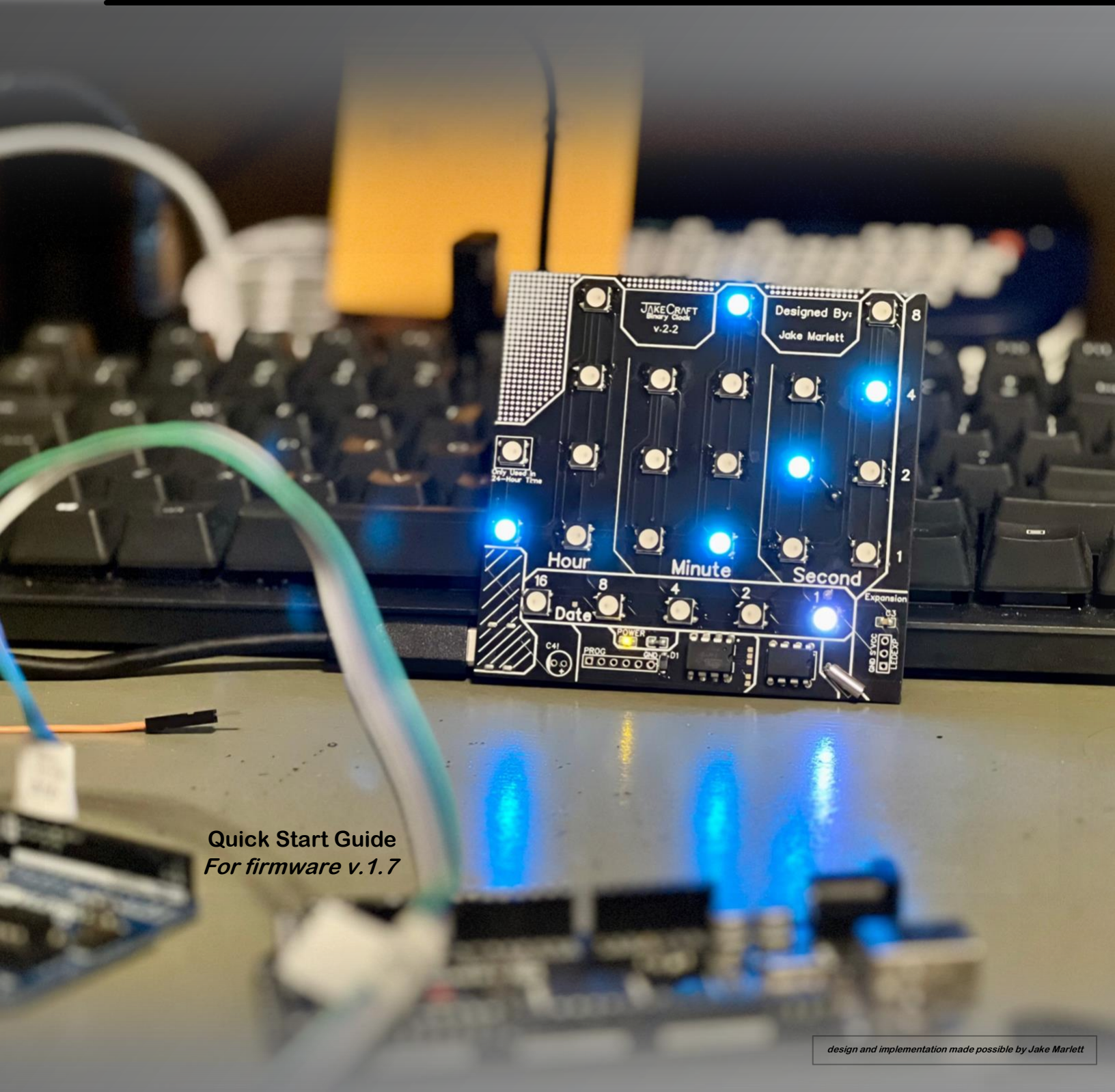


# JAKECRAFT<sup>®</sup>

## BINARY CLOCK

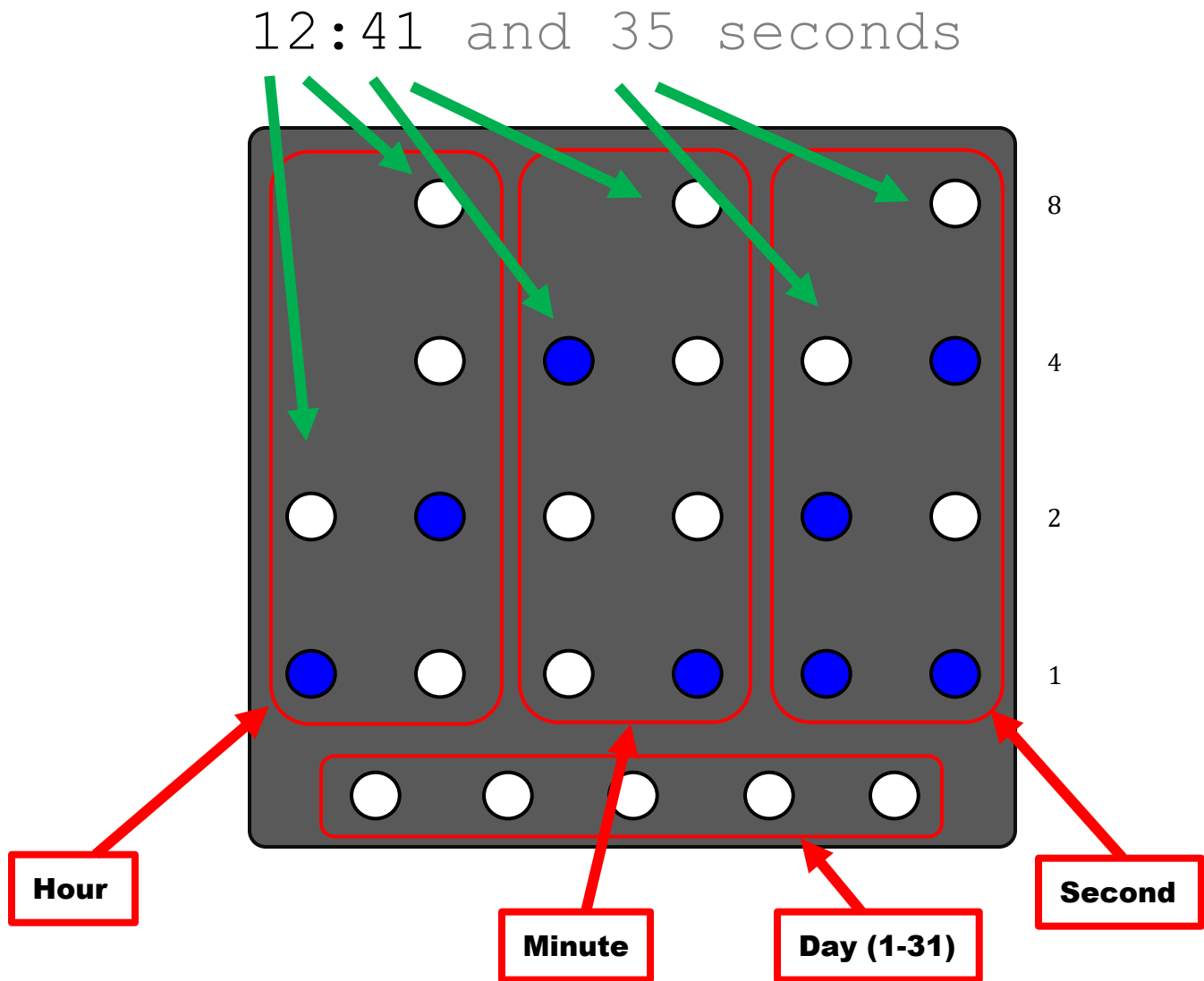
model  
*JBC-85* **v.2.2**



Quick Start Guide  
*For firmware v.1.7*

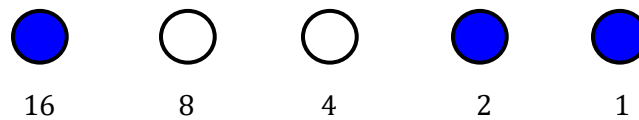
## READING THE CLOCK

The JBC-85 features a unique combination of two number systems – binary and decimal – in an interesting way that is sure to be the centerpiece of many conversations. Still, when you learn how to read this clock, knowing the time becomes much easier. The instructions and a diagram will follow:



Reading the clock begins from the leftmost column. In each pair of columns (3 in total), there is the tens place (left) and the ones place (right). To read what the ones or tens place of each category (hour, minute, second) is, you add up the illuminated LEDs starting from the bottom and going to the top. Remember – each column is in binary (1, 2, 4, 8). In this example, we can see that we have 35 seconds because the tens column is  $2 + 1 = 3$  and the ones column is  $4 + 1 = 5$ . The same can be done for the hour and minute. We know the minute is 41 because the tens column is  $4 + 0 + 0 = 4$  and the ones column is  $1 = 1$ . The hour is 12 because the tens place is a 1 and the ones place is a  $2 + 0 = 2$ .

Just combine the tens and the ones place to find the intended number. For the minute,  $(4 * 10 = 40) + (1 * 1) = 41$ . As you could have guessed and see in the minute example, the left column is **multiplied** by **10** because it is the **tens** column. And of course, the **ones** column is the number **multiplied** by **1**, which is just the number in the column. With this method of reading the clock, you will understand what the time is always. The bottom date row holds the day (1-31) in the current month. Yes – this clock does have leap year calibration so the day of the month will always be accurate. Reading the day is simple as well. In the example below, the 19<sup>th</sup> day of the month is shown:



Much like the time columns, we add up all the lit LED places to find our final number. Remember – in binary the rightmost “digit” is the most significant (1). In this case, reading the number spaces from left to right would be 16—8—4—2—1. And this lines up with what the day is, too.  $16 + 2 + 1 = 19$ , so it is correct. You can see that the non-illuminated LEDs (8 and 4) are **not** added to the total, because they are “off” or 0, when the illuminated LEDs are “on” or 1 and are added to the total. A good rule of thumb when reading binary values is that if the 1’s place is illuminated, the number is odd because the sum of even numbers is an even number. This also checks out too, because 19 is odd, so the ones “digit” is on.

## NORMAL OPERATION

To operate this clock, you will need to know a few different ways the buttons on the back work. On the back of the clock, there are two buttons. Right to left, they are MODE and DST/+. These buttons use a more sophisticated technology than traditional tactile buttons, and they work with the same principle that phone touch screens—or any capacitive touch screen works. They constantly measure the relative capacitance on the pad of the PCB (the board that the components are connected to for the clock), and when this small value changes due to you touching it, it recognizes it as a button press. (If you didn’t know, your body has “parasitic capacitance” to the environment, meaning that a small charge can be [and is] held between you and the environment, causing the clock to be able to read the change and react). Using these buttons, you can do all sorts of things from changing the time to changing the time format and color.

## SETTING DST ON/OFF

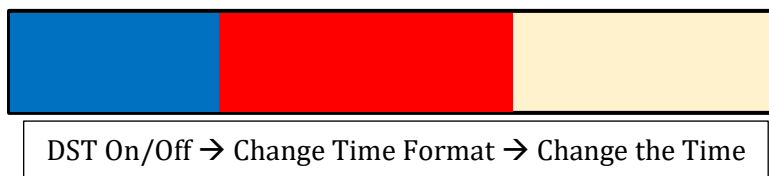
To turn on or off the Daylight-Saving Time (DST) setting, simply tap the rightmost button, labeled DST/+. After you tap the button, you will notice the time go forward or back an hour, depending on if DST was set or not. Don't worry – if the clock loses power, the DST setting will be remembered, so you will not have to change the hour if there is a power fault. If the time wasn't remembered and DST was supposed to be on, the time would move incorrectly when the button is pressed, and thus must be adjusted by changing the hour to the desired hour.

## CHANGING THE TIME FORMAT—12/24 HR

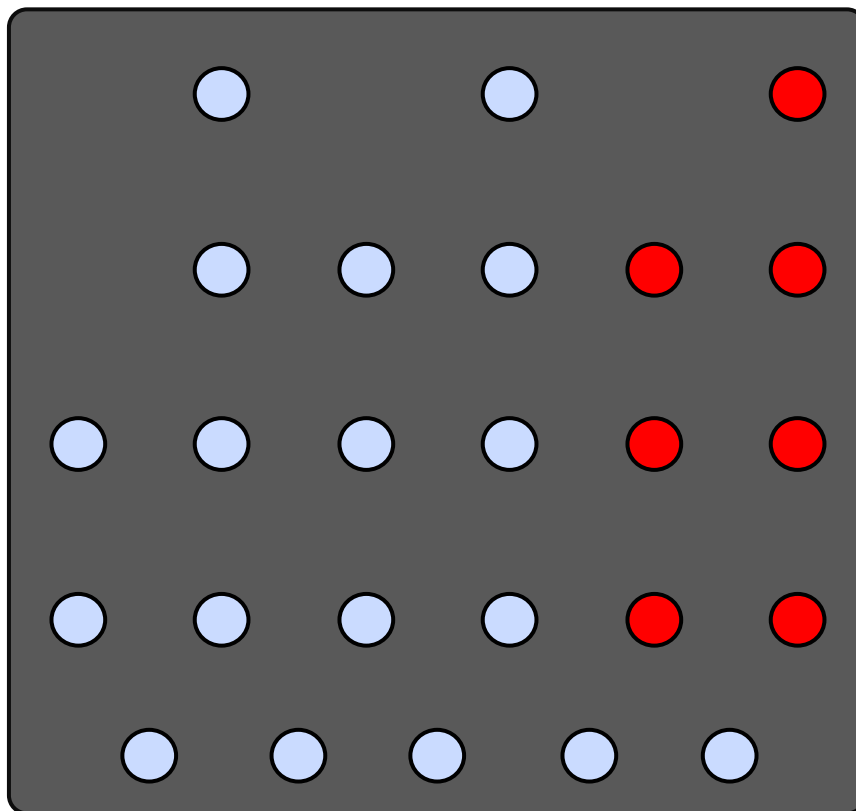
To change the time format, simply hold down the DST/+ button (the right one) when in normal mode (when the time is actively being displayed like normal). After holding for about a second, the bottom date row will light up blue. This means that the clock has recognized the holding. If you let go of the button now, however, the input will be interpreted as you wanting to change the DST setting. Therefore, you must hold down the button until the date row turns red. Once it does, you can release the button, and the time format will change between 12-24 hour. Right after you release your finger from the virtual button, a red dot will momentarily light up on the left hour column (the tens column). If the red dot blinks on the 1's row, the clock is indicating that the time is now set in 12-hr format. However, if the red LED flashes on the 2's row (the LED labeled "Only Used in 24-Hour Time"), then the clock is indicating the time will now be shown in 24-hour time format. To revert the settings back to how they were, perform the same button hold as you did before, releasing the DST/+ button when the date row turns red, and the time format will be back to what it was originally set as.

## CHANGING THE TIME

To change the time, you will need to get into the time change menu. To do this, the steps are very similar to those listed above. Just press and hold on the DST/+ button and keep holding until the date row illuminates as a warm white. The color scheme on the date row for holding the DST/+ button is shown below:



When the custom row turns warm white, you will be in the time editing menu when you release your finger from the button. Now the clock will have its two rows for displaying the seconds illuminated red, while all the other columns are a pale white. To advance the desired row to edit, simply tap the DST/+ button. You will notice the column(s) illuminated red now are different. As you can see in the figure below, the seconds are selected to be edited.



The flow of pressing the DST/+ button goes Seconds → Minutes → Hours → Day, and then back again to Seconds. When the desired value to change is illuminated as red, tap the MODE button to change the corresponding time. Now the red LEDs will represent the corresponding time (or value) stored in that specific field. Use the DST/+ button to increase the value, or (in the case of seconds) change the value to 0 which is useful for syncing the clock to another accurate clock. When the desired time is set, tap the MODE button to exit back into the main time change menu that you saw before. When the desired time is set after changing whatever values necessary, you can hold either the MODE button until the date row turns blue (about 1 second), or the DST/+ button until the date row turns red (about 2 seconds) to exit. The new, updated time will now be displayed on the clock.

## CHANGING THE COLOR OF THE LEDs ON THE CLOCK

Changing the color of the clock is very simple. The color can be changed by simply pressing the MODE button once. NOTE – if you keep tapping the MODE button to find a color and the clock “turns off” (all the LEDs turn off), don’t worry. You have reached the power save mode of the clock. Tapping the MODE button once more will turn it off and allow you to keep changing the color, but when the power save mode is on, all actions on the main chip are temporarily disabled and the clock is effectively turned off, although it is still getting power and keeping the time in the background on the Real-Time Clock chip. Remember—even if the clock loses power, it will keep the time if the back-up battery found on the back of the clock is still good. The time will be reset to October 11, 2023, at midnight if the back-up battery fails.

### *Available in firmware 1.7.0+: RGB “gamer” mode*

This mode can be accessed through changing the color (it is the color after the “off” color) and will continuously sweep the color from blue to red and back again. This behavior creates for a cool effect that is sure to draw attention. NOTE: Because of the limited number of bits when setting colors on these LEDs, the LEDs will appear to jump between colors when at minimum brightness. This is completely normal, just a slight limitation.

## CHANGING THE BRIGHTNESS OF THE LEDs ON THE CLOCK

The variable brightness modes of the JBC-85 are a very handy feature if you want to save power and make the clock’s LEDs dimmer or brighter to suit the environment. Unlike the complete power save mode like mentioned before, this mode still allows you to read what time and day it currently is, even at the dimmest setting. To change the brightness, just hold the MODE button down until the custom row turns blue, then release. Like what happened with changing the DST setting, a series of red LEDs will flash on the clock. These LEDs on the date row show which of the six brightness levels you have set. If the date row flashes all red, the clock will be at full brightness. The brightness level decreases one from the left each time, and minimum brightness is shown when none of the date row LEDs illuminate immediately after releasing the button. In this case, the LEDs will be illuminated at 13% of their original brightness, or 2% of their maximum brightness, saving power. The best part about this power saving mode is that you can still fully use the clock with all its features even when it’s in this mode. To set a different desired brightness, you just repeat the same steps as before – hold the MODE button until the custom row turns blue and release.