

User Manual Binary Led Clock

Power for your Binary Clock

The clock does not include a wall adapter. You should get a universal adapter yourself, these are not very expensive. The preferred voltage is 9VDC, but often 8VDC – 15VDC will do nicely too. The middle pin of the plug is the positive. Universal adapters often come with a set of various plugs, choose one that fits. If none them fits, you can use the dc-plug is included with the clock. If the clock does not work, you may have gotten the polarity wrong. Change the polarity and try again.

Setting the Binary Clock

This clock doesn't use readable digits, but BCD (Binary Coded Decimal) representation. There are six columns of 4 leds each. Each column represents a 'digit'. From left to right, the time is displayed in hours, minutes and seconds. The format is HH:MM:SS. Reading the BCD values and converting them to decimal values is easy. The top row leds have a value of '1', the second row has a value of '2', the third row a value of '4' and the bottom row a value of '8'. At first it takes a while to get used to this, but after a week it seems all natural. To be honest, the only natural thing about this clock is that it will drive you nuts in the beginning. But hey, you wanted a special clock, and you have got one for sure... Anyway, after a while it gets easier to read the time quickly. Well, I hope so.

Turn on the clock by plugging in the wall adapter. The time will start at 12:00:00 and blinks. Press and hold the set button, for about 5-6 seconds until the first column starts blinking. Release the button.

Now, with each short press of the button, you can advance the first 'digit'. The format is 24 hours, so the first column only changes from 0-1-2 etcetera. After the digit is set correct, press the button again for 2 seconds, and see that the second column will start blinking. Set all the other columns in the same way. Of course, when a column is zero, none of the leds in the column will be lit, so you are a bit lost there. But you can always tell in which column you are, by giving short presses and incrementing the 'digit'.

Once you have set all digits, press and hold the button for 5-6 seconds, and the clock will resume normal operation.

At first, this may seem a bit of a hassle, but after a while you will notice that it is remarkably easy to set the clock.

Calibrating the Binary Clock

The clock uses a default calibration value of 5000. If you want the clock to run really accurate, you need to calibrate it. Press and hold the set button, for about 7-8 seconds. While you hold it, you will first see that the first column blinks, and then after another 2 seconds it will show the calibration value. Now release the button. There should be 4 digits displayed now, but remember that a zero is displayed as a column with all rows off. Now you can set a new calibration value for the timing of the clock. First check this value is set at 5000. After setting this value, press and hold the button for 5-6 seconds, to return to normal mode. This value will be stored inside the microcontroller. Turn off the clock, and turn it on again.

Now set the clock, using a reliable time reference. Set the clock as described earlier, and wait until your time reference matches the time you have set. Now press and hold the set button for 5-6 seconds, and notice that the clock now runs synchronous with your reference, both displaying the same time.

Using the standard calibration value of 5000, the clock should run with a better accuracy than +/- 10 seconds per day. Let the clock run for a couple of days, and note the time difference between the binary clock and the reference clock you have used. Calculate the number of milliseconds per hour the clock runs too fast or too slow.

Example: after 2 days, the binary clock seems 7 seconds too fast. Divide by 48 hours, And multiply by 1000. That's 145 millisecond per hour. The clock needs to run 145 milliseconds per hour slower, so the new calibration value will be $5000 - 145 = 4855$.

Enter the new calibration value, turn off the clock, and turn it on again. Now you can set the clock, and it will be more accurate now. Repeat the procedure if need be.

Setting General Options

In this option setup you can select various animations of the led display, and also you can set it for 12 hour mode, and possibly to let the clock work with an radio receiver module for atomic time, such as the european DCF77 system. Press and hold the set button, for about 11 seconds. You will go through the time-set-mode and calibration-mode to arrive in the option set mode. Now release the button. There should be 6 'values' displayed now, any value is possible. Each column is for a particular option, and its value tells something about that option.

The first column sets the animation mode. When it is zero, with all leds off, the clock uses no form of animation at all. It just displays the time, when returned to normal operation. Depending on the value you set in the first column, the clock will display the time in an animation mode, according to this list:

- 0 – no animation
- 1 – fading leds
- 2 – scrolling from left to right
- 3 – scrolling from right to right
- 4 – scrolling from bottom to top
- 5 – scrolling from top to bottom
- 6 – scrolling in various directions
- 7 – pseudo random shuffle

The second column select the 12 or 24 hour mode. 0 (with all leds off) selects the 24 hour mode, a 1 selects the 12 hour mode.

The third column selects the decoding system used for a radio receiver for atomic time. Since only DCF77 is supported, it should always be set at 0.

The fourth column sets the number of hours that need to be added or subtracted to the received atomic time. For instance, if you are in the UK and want to use the DCF77 system,

you need to subtract one hour. Set the column to a value of 1. Only the top three leds are used for the number of hours here. The bottom led in this column tells the clock if the number should be added or subtracted. When it is on, the value will be added, when it is off, the value will be subtracted.

The fifth and sixth column have no function. They are always '0' and thus all leds in these columns are off

If you have any further questions, please contact me at support@franktechniek.nl or look for additional information at www.franktechniek.nl

Have fun with your new binary clock!

Thanks,
Frank Bemelman.