



Nixie Clock Users Manual WIFI

Thank you for your purchase

Your new Nixie clock has been constructed using new- old nixie tube stock manufactured in the late 70s from Russia. It is a beautiful mix of old and new, resulting in a high accuracy, low power clock which will be a talking point in your home.

If you would like to reach us- You can contact us by email: sales@thdesigns.store or visit our website at thdesigns.store.

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Description

The clock has the following features:

- Latest technology, highly reliable and accurate.
- Tried and tested design, with many hundreds of clocks sold.
- Low power consumption.
- Long tube life: Anti Cathode Poisoning (ACP) and configurable blanking makes sure that the tubes will stay healthy for many years with no intervention from you.
- The multiplexed display and automatic dimming used in this design extends the life of the tubes indefinitely. Some other designs run the tubes too “hard”, and this causes a rapid degradation in the useful life of the tube.
- Automatic roll mode – periodically rolls through all digits on all locations to check that the display is healthy. This is normal and part of the ACP strategy.
- RGB back lighting allows you to set the color of the back lighting to practically any color you desire.
- All settings are stored in non-volatile memory. Once they are set, they are remembered forever, or until you change them again.
- Silent operation. Some Nixie clock designs emit an irritating “buzz” or “hiss” which is especially annoying if you keep the clock in a bedroom.
- Ambient light sensing, with automatic tube dimming, which sets the tube and LED brightness according to the light conditions. This also increases tube life.
- Automatic week day or weekend blanking strategies available to extend the life of your tubes
- Automatic time of day blanking (see basic settings “05”), can blank between a start hour and an end hour, on week days, weekends or every day

This clock is equipped with an WIFI time provider. It makes sure that your clock is always right, (even when daylight savings change), and never drifts because the time is synchronized with the internet’s atomic clocks. The option has the following features:

- Configure and forget. It just runs. No intervention necessary ever.
- The time never drifts – it is always right within 1 second, year after year, even after daylight savings time changes.
- Really simple configuration: You just enter your WIFI SSID and password, and the time zone, and the rest happens automatically.
- Logs into your WIFI network. You configure the module with the credentials, and it remembers the settings forever, or until they change.
- Low power consumption.
- All settings are stored in non-volatile memory. Once they are set, they are remembered forever, or until you change them again.
- Configure the clock setting from the web interface. Makes setting up the clock easy and quick.

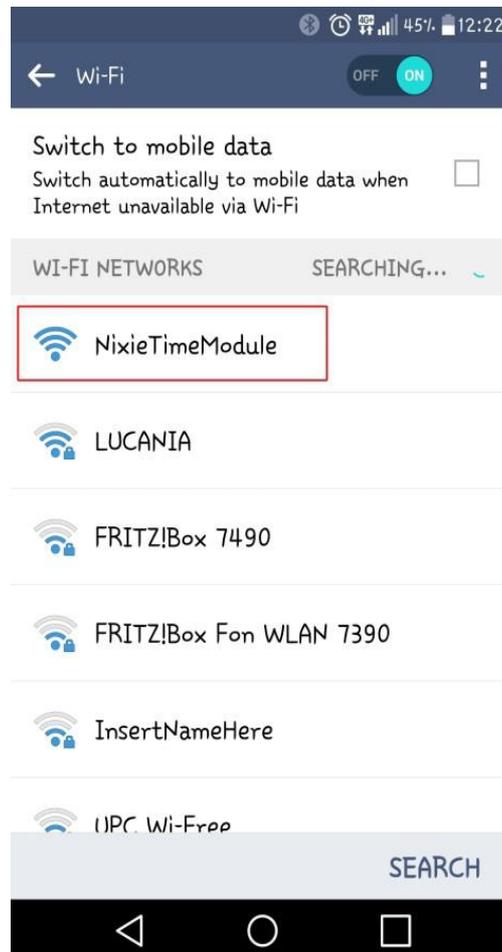
Powering Your Clock the 1st Time- WIFI SETUP

When you power your clock for the first time, the time will be off since it does not know how to connect to your WIFI network just yet. Turn the clock on, and log into it using a **wifi enabled** computer, phone or tablet. Go to your connection settings on that device and under available networks and select the access point called “NixieTimeModule”.

NOTE: The “ NixieTimeModule” access point will only be activated on powerup AFTER an unsuccessful attempt to connect to a WLAN. It’s a security feature. Since we tested the interface at our factory before shipping, the module will need to complete an unsuccessful attempt on your network. So for the first time, you must turn power on- wait 30 seconds, cycle power.

Step 1: Select the NixieTimeModule access point

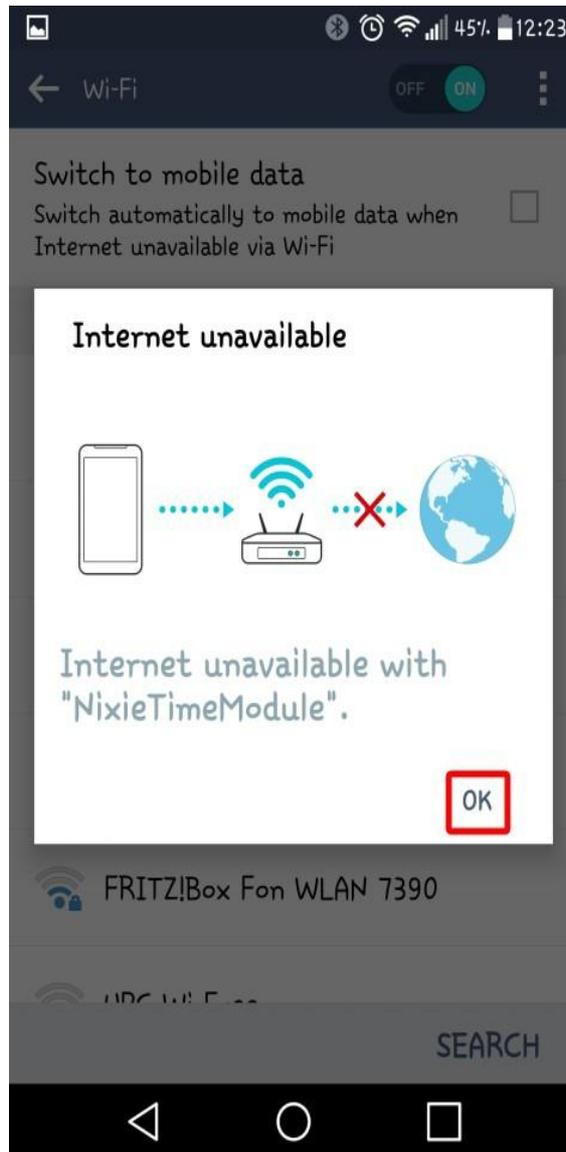
Search in the list of WIFI networks for the one called “NixieTimeModule” and connect to it. There is no password



Step 2: Accept the message saying that Internet is not available

When you have connected to it, you might get a message that Internet is not available. This is fine, just say "OK" to the message.

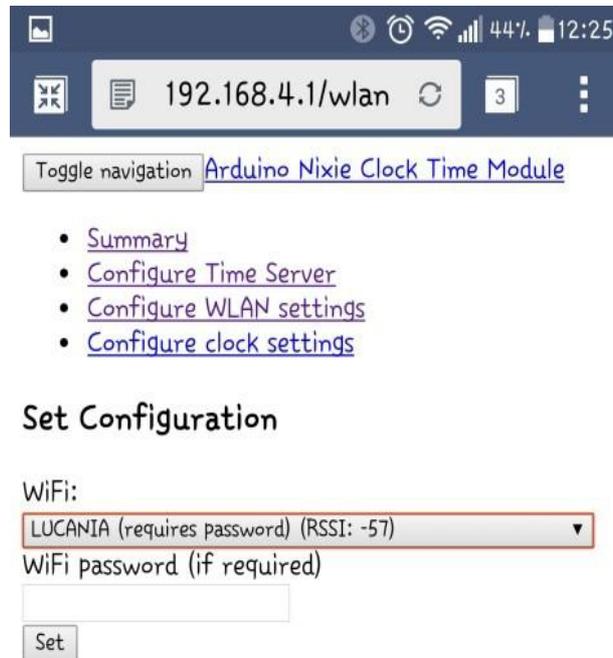
You might not get this message, depending on the device you have. It's only important that that you manage to connect to the "NixieTimeModule" network.



Step 3: Configure the WLAN

Now you can log into the Module with a browser and configure it. Open a browser on the wifi device and enter the URL. http://192.168.4.1/wlan_config

Don't worry if the browser looks a bit ugly at the moment, it is because we are not able to access the style sheets from the Internet (because the module doesn't have Internet access until you configure the WLAN).



Select the network you want the clock to use from the list and enter the password for that network. For this example, I have chosen the network “LUCANIA”. Press “Set” once you are ready. The clock is now on your network. The access point will disengage, and you will have to log into the clocks assigned IP address on your network to complete the installation.

Step 4: Find the IP address of the module on the network

There are many different ways to do this, but the easiest is to look at the summary tab or log into your router administrator. Enter your routers admin and password. You should find an entry in the “connected devices” list which starts with “ESP_XXXX” with some numbers and letters after it. This is your clock, and the IP address assigned will be shown there. In my case its 192.168.1.116

Remember the IP address, or write it down. You will need it in a couple of minutes.

For me, my summary page looks like this:

Toggle navigation [Arduino Nixie Clock Time Module](#)

- [Summary](#)
- [Configure Time Server](#)
- [Configure WLAN settings](#)
- [Configure clock settings](#)

Current Status

Name	Value
WLAN IP	192.168.1.116
WLAN MAC	5C:CF:7F:0D:70:F7
AP IP	192.168.4.1
AP MAC	5E:CF:7F:0D:70:F7
WLAN SSID	LUCANIA
Time server URL	http://time-zone-server.scapp.io/getTime/Europe/Zuri
Time according to server	2016,5,1,12,25,46
Uptime	0 days, 2 hours, 3 mins, 8 secs
Time last update	51239
Version	1.0.0
Found I2C slave at	104

ESP8266 information

Name	Value
Sketch size	269580
Free sketch size	167936
Free heap	32568
Boot version	5
CPU Frequency (MHz)	80
SDK version	1.5.2(7eee54f4)
Chip ID	880887
Flash Chip ID	1327328
Flash size	10118576

Step 5: Login to the module using the WLAN assigned by your router

Now that the module is configured on your WLAN, you should change back to your normal WLAN and log into the address of the clock noted in the previous step. Now things should look a bit nicer:

Arduino Nixie Clock Time Module

Summary Configure Time Server Configure WLAN settings Configure clock settings

Current Status

Name	Value
WLAN IP	192.168.1.116
WLAN MAC	5C:CF:7F:0D:70:F7
AP IP	192.168.4.1
AP MAC	5E:CF:7F:0D:70:F7
WLAN SSID	LUCANIA
Time server URL	
Time according to server	ERROR

Uptime: 0 days, 0 hours, 0 mins, 51 secs
Time last update: 47218

Step 6: Select the time server and time zone

Now you can set the time server and time zone.

Our free time server is at:

<http://time-zone-server.scapp.io/getTime/>

You have to know the time zone you are in. The easiest way is to select the town nearest to you from the list on this page:

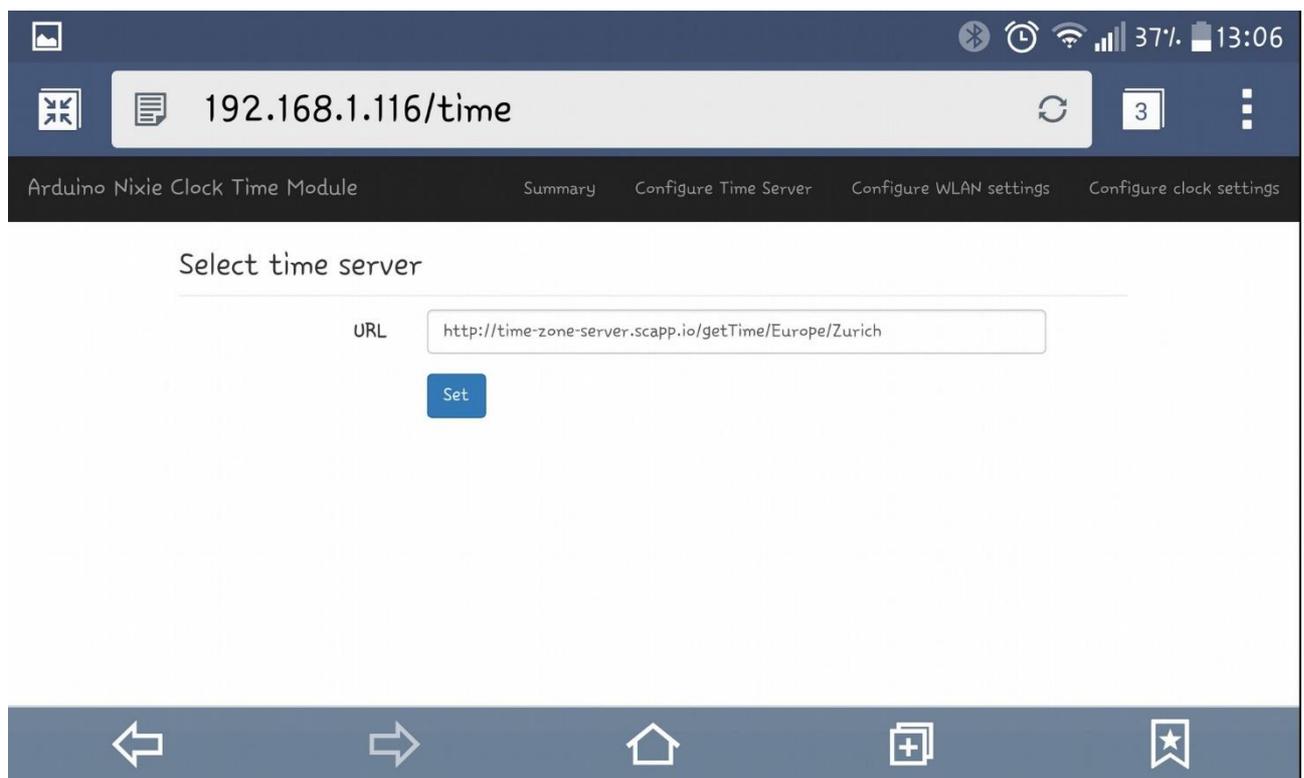
https://en.wikipedia.org/wiki/List_of_tz_database_time_zones

I live in Phoenix, so I select “America/Phoenix”. The full URL is:

<http://time-zone-server.scapp.io/getTime/America/Phoenix>

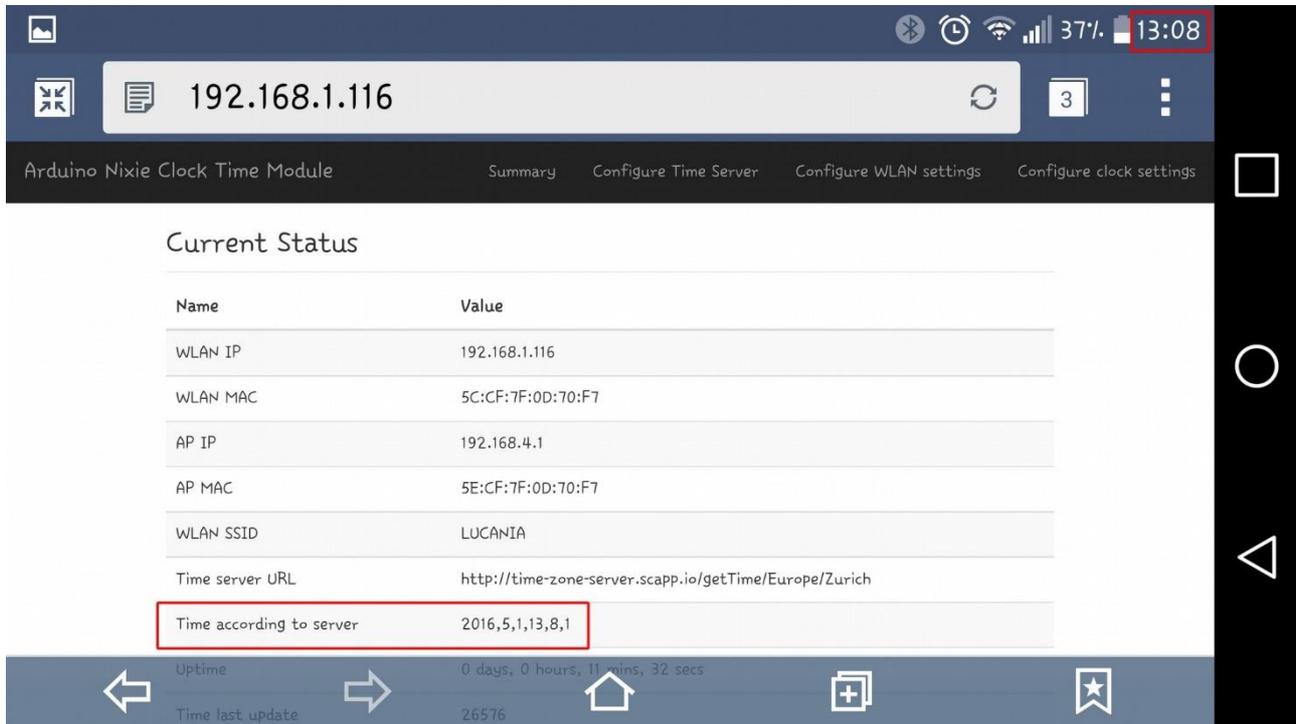
Enter this in the page “Configure Time Server”, and press “Set”

In most cases we have done this for you at the factory.



Step 7: Check that you are getting the right time

If you have set up the time zone correctly, you should now be able to see the current time in the summary page:



The screenshot displays a mobile web interface for an Arduino Nixie Clock Time Module. The address bar shows the IP address 192.168.1.116. The page title is "Arduino Nixie Clock Time Module" and the navigation menu includes "Summary", "Configure Time Server", "Configure WLAN settings", and "Configure clock settings". The main content area is titled "Current Status" and contains a table with the following data:

Name	Value
WLAN IP	192.168.1.116
WLAN MAC	5C:CF:7F:0D:70:F7
AP IP	192.168.4.1
AP MAC	5E:CF:7F:0D:70:F7
WLAN SSID	LUCANIA
Time server URL	http://time-zone-server.scapp.io/getTime/Europe/Zurich
Time according to server	2016,5,1,13,8,1

At the bottom of the interface, there is a status bar showing "Uptime: 0 days, 0 hours, 11 mins, 32 secs" and "Time last update: 26576".

My time shows as 2016,5,1,13,8,1, which is in the format year, month, day, hours minutes, seconds so 13:08:01 on the 1st May 2016.

That's it! From now on, the NixieTimeModule will check the time every minute and make sure that the Nixie Clock never drifts from the right time.

You should see the time on your Nixie clock change to the correct time within one minute!

Step 8: IMPORTANT: Cycle power to secure the WIFI module

You must restart the module, in order to close the "NixieTimeModule" access point. This will prevent someone from accessing your network thru the clock.

To restart, simply Turn the power off and back on. the open access point is now closed and available only on your network via the ip address assigned by the server that you wrote down earlier

Please see the section on "Security" for more information.

Configuring your clock

As an additional function, you can configure the Nixie clock from the WIFI module as well. This makes configuring the clock very easy and quick.

Just go to the “Configure clock settings” section of the module, and you will see the current settings. All of the possibilities of the clock are laid out here.

You can still set all the configuration settings using the traditional way directly on the clock, if you want to.

The main configuration page looks like this:

Arduino Nixie Clock Time Module Summary Configure Time Server Configure WLAN settings Configure clock settings

Set Configuration

12H/24H mode: 12H 24H

Blank leading zero: Blank Show

Scrollback effect: On Off

Suppress ACP when dimmed: On Off

Date format: DD-MM-YY

Day blanking: Blank between start and end hour during week days

Blank from: 7

Blank to: 17

Fade steps: 50

Scroll steps: 4

Back light: Cycling RGB backlight, dims with ambient light

Red intensity: 15

Green intensity: 0

Blue intensity: 0

Backlight Cycle Speed: 4

12H / 24H hour time. The hours are displayed in 12 or 24-hour mode.

Default: 24H mode.

Blank leading “0”. Blank out the leading “0” from single digit hours.

Default: Don't blank.

Scroll back. Use the scroll back (rapid count down) effect when changing from “9” to “0”. Default: enabled

Suppress ACP when dimmed. The Anti Cathode Poisoning which runs during the night lights the digits up at full brightness, and some people might find this disturbing. Using this setting, you can stop ACP happening when the display is fully dimmed (e.g. at night).

Default: Enabled.

Display blanking. To preserve the tubes, you can set the display to be blanked. Note that blanking can be overridden from the clock, see the section below.

Options:

- “Never blank”: the display runs all the time
- “Blank all day on weekends”: the display is blanked at weekends.
- “Blank all day on week days”: the display is blanked on week days.
- “Blank always”: The display is always blanked unless you tell it to come on.
- “Blank during selected hours every day”: Blank between the start and end hour every day, week days and weekends.
- “Blank during selected hours on week days and all day at weekends”: The display is blanked during the hours you define during week days and all day at weekends.
- “Blank during selected hours on weekends and all day on week days”: This blanks the clock during the selected hours on weekends and all day on week days.
- “Blank during selected hours on weekends only”: This blanks between the start and end hour on weekends.
- “Blank during selected hours on week days only”: This blanks between the start and end hour on week days.

Default: “Never Blank”

Blanking From. Hour blanking will start at this hour, on the days set by the Display Blanking Mode. If the display blanking mode does not use hours, this setting is not enabled.

Blanking To. Hour blanking will end at this hour, on the days set by the Display Blanking Mode. If the display blanking mode does not use hours, this setting is not enabled.

Blanking Hour Start. Hour blanking will start at this hour, on the days set by the Display Blanking Mode.

If the display blanking mode does not use hours, this setting is not shown.

Blanking Hour End. Hour blanking will end at this hour, on the days set by the Display Blanking Mode. If the display blanking mode does not use hours, this setting is not shown.

Fade Steps. This sets how quickly one-digit fades into the next one. You can also turn off the fade feature completely. It can be set from 20 (fast) to 200 (very slow). **Default: 50.**

Scroll Steps. This sets how quickly each scroll back digit is displayed when we scroll back from 9 to 0. You can also turn off the scroll feature completely. It can be set from 1 (very fast) to 40 (very slow). **Default: 4.**

Back Light. This sets the mode of the back light. **Default: "Fixed RGB backlight, no dimming"**

- "Fixed RGB backlight, no dimming". There is a constant color on the back light, which stays bright all the time, even at night when the display is dimmed. The Red, Green and Blue intensities are set using the channel intensities below.
- "Pulsing RGB backlight, no dimming". This pulses the back light but does not dim with the display. The Red, Green and Blue intensities are set using the channel intensities below.
- "Cycling RGB backlight, no dimming". The back-light cycles through random mixes of colors but does not dim with the display. The intensities of the channels are managed by the software.
- "Fixed RGB backlight, dims with ambient light". There is a constant color on the back light, which dims as the display is dimmed. The Red, Green and Blue intensities are set using the channel intensities below
- "Pulsing RGB backlight, dims with ambient light". This pulses the back light, which dims as the display is dimmed. The Red, Green and Blue intensities are set using the channel intensities below.
- "Cycling RGB backlight, dims with ambient light". The back-light cycles through random mixes of colors, which dims as the display is dimmed. The intensities of the channels are managed by the software.

Red Channel Intensity. Sets the maximum intensity of the red channel back light. This will be dimmed according to the display dimming. If you are in cycle mode, this setting does not do anything. The value can be set from 0 (off) to 15 (bright). **Default: 0**

Green Channel Intensity. Sets the maximum intensity of the green channel back light. This will be dimmed according to the display dimming. If you are in cycle mode, this setting does not do anything. The value can be set from 0 (off) to 15 (bright). **Default: 0**

Blue Channel Intensity. Sets the maximum intensity of the blue channel back light. This will be dimmed according to the display dimming. If you are in cycle mode, this setting does not do anything. The value can be set from 0 (off) to 15 (bright).

Default: 15

Backlight Cycle Speed. If you are in cycle mode, this controls the speed at which the colors cycle. The higher the number, the slower the colors will change. The value can be set from 2 (very fast) to 64 (very slow). Default: 10

Security

The module is by design already quite secure. There is no known way of connecting to the open “NixieTimeModule” network and doing anything other than changing the clock settings. There is no known way of accessing through the open network to your WLAN network. However, we designed the software in the module to provide the highest security possible.

The module tries to connect to the configured Wireless LAN on start up. If it manages to connect, it will shut down the “NixieTimeModule” access point. You can still get into the module configuration through your WLAN, using the IP address assigned by the router.

If for any reason the module is not able to connect to your WLAN (say, you changed the password, or the network name), it will switch over to the real time clock chip and try to reconnect every 5 minutes.

In order to activate the access point again, assuming the clock has already unsuccessfully attempted to access the network, you will need to cycle power and redo the installation procedure starting from step one. **The “NixieTimeModule” access point is only available after a power cycle following an unsuccessful attempt to log into your network.** This is a security feature to make sure you are in control of when the access point is opened.

General Operations

The clock has different modes of operation, which you select using the pushbutton. When you start the clock up the very first time it will start in “Time Display Mode”. After it connects to the internet and talks with the time cloud server, you will never have to set the time or date.

If you press the button for differing lengths, different things will happen.

- **“Short Press”** (less than 1 second): A temporary display will be shown for 5 seconds. This is useful if you want to know the date, for example. The options here are given in the section “Display Mode”
- **“Medium Press”** (more than 1 second): The clock will go into “Setting Mode” to allow you to change settings.
- **“Long Press”** (more than 8 seconds): The clock will go into “Tube healing mode”. Read the section on “Tube healing Mode” before using this mode. This mode can damage your tubes if you don’t use it correctly!

Every 10 minutes (at “xx:x9:15”, the clock will do “Anti-Cathode Poisoning”, which will cycle all the digits for about 15 seconds. If enabled, the slots mode will temporary display the date once per minute for approximately 5 seconds. The bulbs will scroll like a slot machine before and after displaying the date.



Display Mode

Normally, the clock will show the time. To show additional information press the button with a “short” press. Each press cycles through the following information. After 5 seconds, the display will revert to the normal time display.

Mode	Description	Values
Date	The current Date is shown	
Temp	The current internal temperature inside the clock case will be shown in degrees Celsius. The temperature in the case should never exceed 40 degrees C.	<40 ° C
Light	This shows the current ambient light reading from the LDR (light dependent resistor). It is a normalized value and goes between 100 (dark) to 999 (bright). This controls the dimming of the tubes.	100: Darkest 999: brightest
Version	Display the version number. The format will be: “VV vv 07”, where major version is “VV”, minor version is “vv” and the “07” is the id for the version display	00:51:07

Settings Mode

With the WIFI option installed we recommend logging into your clock and using the GUI to set your preferences. However, it can be done manually using the select button on the back of your clock.

To enter setting mode, press the button for more than 1 second (“medium press”). The “RGB back light” LEDs will start to flash white. The number of consecutive flashes indicates the mode you are in.

Each medium press of more than 1 second will move the setting mode onto the next item. To change a setting, press the button for less than one second, and then release it (“short press”). Once the clock has established an internet connection, the time and date is set automatically for you. When entering the setup mode, the last two digits on the clock indicate the mode and the 1st 4 digits are used for the setting. See Table Below

To exit the setting mode before going through all the options, press the button for more than 2 seconds. The “RGB back light” LEDs will return to their normal operation. Another way of exiting is to cycle through all the setting options, after which you will return to time mode.

Basic Settings		
"00" flashing	12 or 24-hour time. The hours are displayed in 12 or 24-hour mode	"1" = 12 hour "0" = 24 hour default: 1
"01" flashing	Blank leading "0". Blank out the leading "0" from single digit hours	"1" = blank "0" = don't blank default: 1
"02" flashing	Scroll back. Use the scroll back (rapid count down) effect when changing from "9" to "0".	"1" = enable "0" = disable default: 0
"03" flashing	Fade. Use cross digit fading	"1" = enable "0" = disable default: 1
"04" flashing	Date format. Set the format that the date is displayed in	"0" = YY.MM.DD "1" = MM.DD.YY "2" = DD.MM.YY default: 1
"05" flashing	Display blanking. To preserve the tubes, you can set the display to be blanked. Options: "4" = "hours": Blanks between the start and end hour every day. "5" = "H or weekends": This blanks all day during the weekends and between the start and end hour every other day. "6" = "H or week days": This blanks all day during the week days and between the start and end hour every other day. "7" = "H on weekends": This blanks between the start and end hour on weekends. "8" = "H on week days": This blanks between the start and end hour on week days.	"0" = Don't blank "1" = Weekends "2" = Week days "3" = Always "4" = Hours "5" = H or weekends "6" = H or week days "7" = H on weekends "8" = H on week days' default: 0
"06" flashing	Blanking Hour Start. Hour blanking will start at this hour, on the days set by the Display Blanking Mode. If the display blanking mode does not use hours, this setting is not shown.	Default: 00

"07" flashing	Blanking Hour End. Hour blanking will end at this hour, on the days set by the Display Blanking Mode. If the display blanking mode does not use hours, this setting is not shown.	Default: 07
"08" flashing	Anti-Cathode Poisoning night suppression. (If clock is equipped with LDR option) The ACP which runs during the night lights the digits up at full brightness, and some people might find this disturbing. Using this setting, you can stop ACP happening when the display is fully dimmed (e.g. at night)	"1" = don't do ACP when dimmed "0" = do ACP always default: 1
Special Effects Settings		
"09" flashing	USE LDR. If you disable the LDR, the tubes will always work at maximum brightness.	"1" = enable "0" = disable default: 1
"10" flashing	Blank Mode. You can set the tubes, the LEDs or both the tubes and the LEDs to be blanked when in blanking mode.	"0" = tubes only "1" = LEDs only "2" = tubes and LEDs default: 2
"11" flashing	Fade Speed Slower. Each short press will make the fade speed between digits slower	Max: 200 Min: 20 Default: 50
"12" flashing	Fade Speed Faster. Each short press will make the fade speed between digits faster.	Max: 200 Min: 20 Default: 50
"13" flashing	Scroll-back Speed Slower. Each short press will make the "scroll back" speed slower.	Max: 40 Min: 1 Default: 4
"14" flashing	Scroll-back Speed Faster. Each short press will make the "scroll back" speed faster	Max: 40 Min: 1 Default: 4
"15" flashing	Slots Mode. You can have the date shown automatically once per minute for about 5 seconds.	"1" = enable "0" = disable default: 1

Back Light Settings		
"16" flashing	<p>Back Light Mode. This sets the mode of the back light.</p> <p>"Fixed" mode will show the back-light color per the Red, Green and Blue channel intensities.</p> <p>"Pulse" will make the intensity of the back light "pulse", brightening for a second and then darkening for a second, but always respecting the relative intensities set by the Red, Green and Blue channel intensities.</p> <p>"Cycle" fades the back lighting randomly, and does not use the Red, Green and Blue channel intensities. These settings will be skipped if cycle mode is selected.</p> <p>Options "0", "1" and "2", do not dim with the bulbs. Options "3", "4" and "5" do if the LDR option is installed.</p>	<p>"0" = Fixed "1" = Pulse "2" = Cycle "3" = Fixed/Dim "4" = Pulse/Dim "5" = Cycle/Dim default: 0 Initial: 3</p>
"17" flashing	<p>Red Channel Intensity. Sets the maximum intensity of the red channel back light. This will be dimmed per the display dimming. If you are in cycle mode, this setting will be skipped.</p>	<p>Max: 15 Min: 0 Default: 0</p>
"18" flashing	<p>Green Channel Intensity. Sets the maximum intensity of the green channel back light. This will be dimmed per the display dimming. If you are in cycle mode, this setting will be skipped.</p>	<p>Max: 15 Min: 0 Default: 0</p>
"19" flashing	<p>Blue Channel Intensity. Sets the maximum intensity of the blue channel back light. This will be dimmed per the display dimming. If you are in cycle mode, this setting will be skipped.</p>	<p>Max: 15 Min: 0 Default: 15</p>
"20" flashing	<p>Cycle Speed. If you are in cycle mode, this controls the speed at which the colors cycle. The higher the number, the slower the colors will change.</p>	<p>Max: 15 Min: 0 Default: 10</p>
HV Generation Settings		
"21" flashing	<p>HV Target Voltage Higher. Each press sets the HV target voltage higher by 5V</p>	<p>Max: 200 Min: 150 Default: 180</p>
"22" flashing	<p>HV Target Voltage Lower. Each press sets the HV target voltage lower by 5V.</p>	<p>Max: 200 Min: 150 Default: 180</p>

"23" flashing	PWM On Time Longer. This setting controls how long the PWM on pulse is. The CPU sets this value. Contact factory before adjusting	Max: 50 Min: 500 Default:(set by cpu)
"24" flashing	PWM On Time Shorter. This setting controls how short the PWM on pulse is. The CPU sets this value. Contact factory before adjusting	Max: 50 Min: 500 Default:(set by cpu)
Misc Settings		
"25" flashing	Increase Minimum dim. This setting allows you to increase the minimum brightness you want to have when the clock is fully dimmed.	Max: 500 Min: 100 Default:200
"26" flashing	Decrease Minimum dim. This setting allows you to decrease the minimum brightness you want to have when the clock is fully dimmed.	Max: 500 Min: 100 Default: 100
"27" flashing	Increase Anti-ghosting. This setting reduces "ghosting" (the number on the right shows faintly on the digit on the left). This is due to transients when switching	Max: 50 Min: 0 Default: 0
"28" flashing	Decrease Anti-ghosting. This setting reduces "ghosting" (the number on the right shows faintly on the digit on the left). This is due to transients when switching.	Max: 50 Min: 0 Default: 0
Information		
"29" flashing	Current case temperature. Show the current temperature inside the case (used as part of the temperature compensation for the clock crystal)	
"30" flashing	Clock version. Show the clock software version.	
	Digit Test. Will roll through all digits on all locations to check that the display is healthy	

Settings Summary

Mode	Factory default setting	Your Settings	notes
00	1		
01	1		
02	0		
03	1		
04	1		
05	0		
06	00		
07	07		
08	1		
09	1		
10	2		
11	50		
12	50		
13	4		
14	4		
15	1		
16	3		
17	0		
18	0		
19	15		
20	10		
21	180		please don't adjust
22	180		please don't adjust
23	150		please don't adjust
24	150		please don't adjust
25	150		
26	150		
27	0		
28	0		

Blanking Mode

During display blanking mode, the tubes will be off depending on the display blanking settings, but the LEDs will continue to work as usual, telling you that the clock is still running.

You can configure the display to blank at weekends, during week days, always or never (the default). Also, you can define hours during which to blank. For example, I have a setting saying that the clock is blanked on weekdays between 7am and 4 pm, while I am out at work. At weekends, the display runs all the time.

You are also able to override the blanking. Press the button while the clock is blanked, and the display will come on again. Pressing the button will display the time for about a minute (60 seconds, but the display is only blanked on the minute change).

If you press the button multiple times within 5 seconds, the blanking will stay off for longer periods:

- 1 Press: 60 seconds
- 2 Presses: 1 hour
- 3 Presses: 4 hours

Tube Healing Mode

After a long period, tube filaments which are not often used (e.g. the “9” on the tens of hours or minutes) can get dim, despite the ACP that is regularly done.

If you make a “super-long” press of the button (more than 8 seconds), the clock will enter filament healing mode. All the power will be placed through a single filament of a single digit to clean it. A short press will change the selected filament.

Another super-long press or cycling through all the filaments will return the clock to normal.

Caution! Don't leave a single filament in this state for an extended period. It is a harsh process and may damage the tube if you leave it in this mode for too long. Normally a few minutes will restore the cathode digit.

Factory Reset

To reset the clock back to initial settings, hold down the button while powering on. The LEDs will rapidly flash some colors to signal that the reset has been done. Everything will be reset back to the factory default state, and the clock will enter first start mode. First start mode is a factory diagnostics tool to check for bulb performance.

First Start and calibration Mode

When you reset the clock, it will run a routine called “First Start Mode”. It cycles through the digits “0” - “9” and drives the High Voltage Generator with a basic setting which does no dimming.

To EXIT First Start Mode, press the pushbutton when the display shows “88:88:88”, and the clock will begin HV calibration mode! The clock will display “88:88:88” for several seconds. This is for the calibration of the High Voltage Generator to match the power adapter you have attached.

After finishing the calibration, the version number (“00:49:07”) will be displayed for a couple of seconds. The clock will then go into normal operating mode.

A video has been posted on YouTube: <https://youtu.be/XA3LOPLX8vI> Once you have exited First Start Mode, it will not enter it again until you do a factory reset

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