

WiFi Time Provider for Arduino Nixie Clock

Operating Instructions

Contact Information

If you want to get in contact with us, please email to:

nixie@protonmail.ch

We'll usually get back to you right away. We can help you with kits or construction. There is also a forum available at:

<https://www.tubeclockdb.com/forum/12-arduino-nixie-clock-kit-support-forum.html>

Short link: <http://bit.ly/2HmXkly>

Repeat order discounts

We also offer discounts for direct purchases, we save the Ebay fees, and share this with you. Contact us for information. Usually this works out as about 10%.

There are also more shipping options available.

Please go here for more information:

<https://www.nixieclock.biz/Store.html>

Short link: <http://bit.ly/2MvRDwk>

Software

The software is available on GitHub at the address:

<https://github.com/isparkes/ArduNix6/tree/master/WifiTimeProviderESP8266>

What this manual is about

This manual describes the set up and initial configuration of the WiFi time module.

For details about the clock setting configuration, please see the manual for the version of the clock you are using!

The WiFi module is an option for all of the clocks based on the Arduino from Nixieclock.biz which have a firmware of

- V55 or later (6-Digit Classic Revision 4 Nixie Clock)
- V355 or later (6-Digit Modular Revision 3 Nixie Clock)
- V655 or later (6-Digit Classic Revision 6 Nixie Clock)
- V455 or later ((6-Digit Classic Revision 4 Nixie Clock running 4-Digit firmware)

Description

This is a WiFi time provider for the Arduino Nixie Clock. It makes sure that your clock is always right, (even when daylight savings change), and never drifts because the time is synchronised with network atomic clocks.

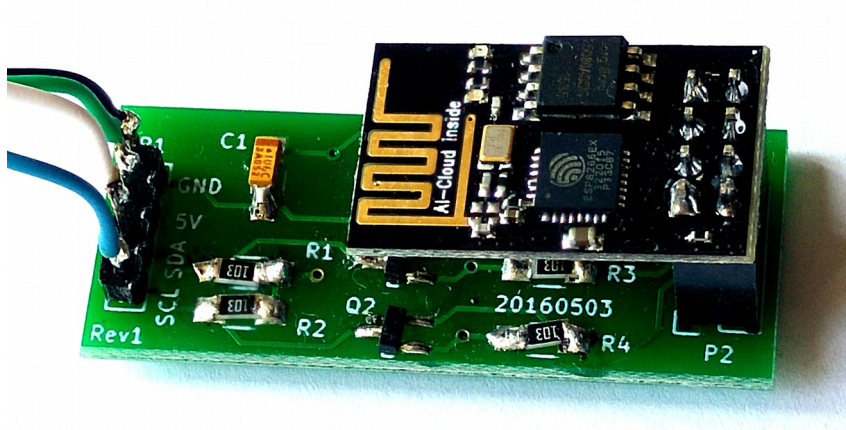
The module has the following features:

- 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 have to 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.
- Based on the ESP8266 micro-controller: Easy to program with the Arduino IDE and well documented.
- Open source software.
- You may modify and load the software
- 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 really easy and quick.

This module works together with the Arduino Nixie Clocks. The clock module is not provided in this package.

Attaching the module to your clock

The module comes in two versions depending on the Clock you have. It is either as an add-on board (Classic Rev4) which comes pre-assembled:



Or as a small package of additional components which are mounted on the main board (All other clock versions) which you will need to assemble on to the main board:

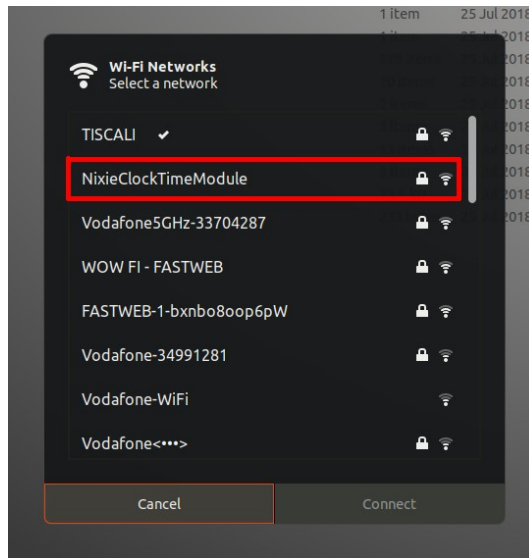


In the case of the add on board, attach the board to the "I2C" connector, making sure to take into account the pin out. Wire the pins on the I2C connector to the pins of the same name on the WiFi module.

Setting the module up for the first time

To set up the module, you will need a computer, phone or tablet with WiFi access. Any device should work.

When you first power on the module for the first time, it will blink the blue LED rapidly 5 times and then stop flashing. This means that the module is awaiting initial configuration, and is waiting for you to connect to the module. In this mode, the module will open up a WiFi access point called "NixieClockTimeModule":



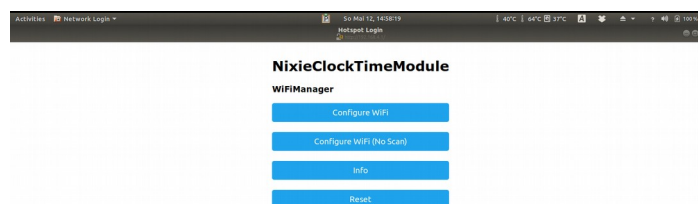
This access point has the credentials:

Credential	Value
SSID	NixieClockTimeModule
Password	SetMeUp!

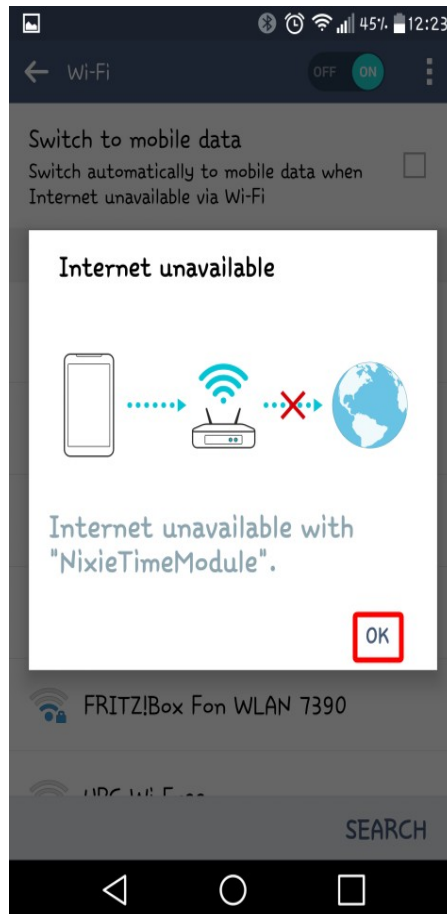
Note: The password is case sensitive!

If the access point does not show up immediately, give it a couple of minutes. Some devices take a few minutes to perform a scan for new networks.

After a few seconds, you should be taken to the captive portal of the module:



On some phones or tablets, you may get the message that “Internet is not available”, or that you have to “Sign in to the network”. Accept these messages if they appear, at which point you should see that the landing page appears as shown above.



When you see the landing page, press the “Configure WiFi” button, and you should see a list of available WiFi networks (it might take a few seconds to come up if you have many networks in your area).

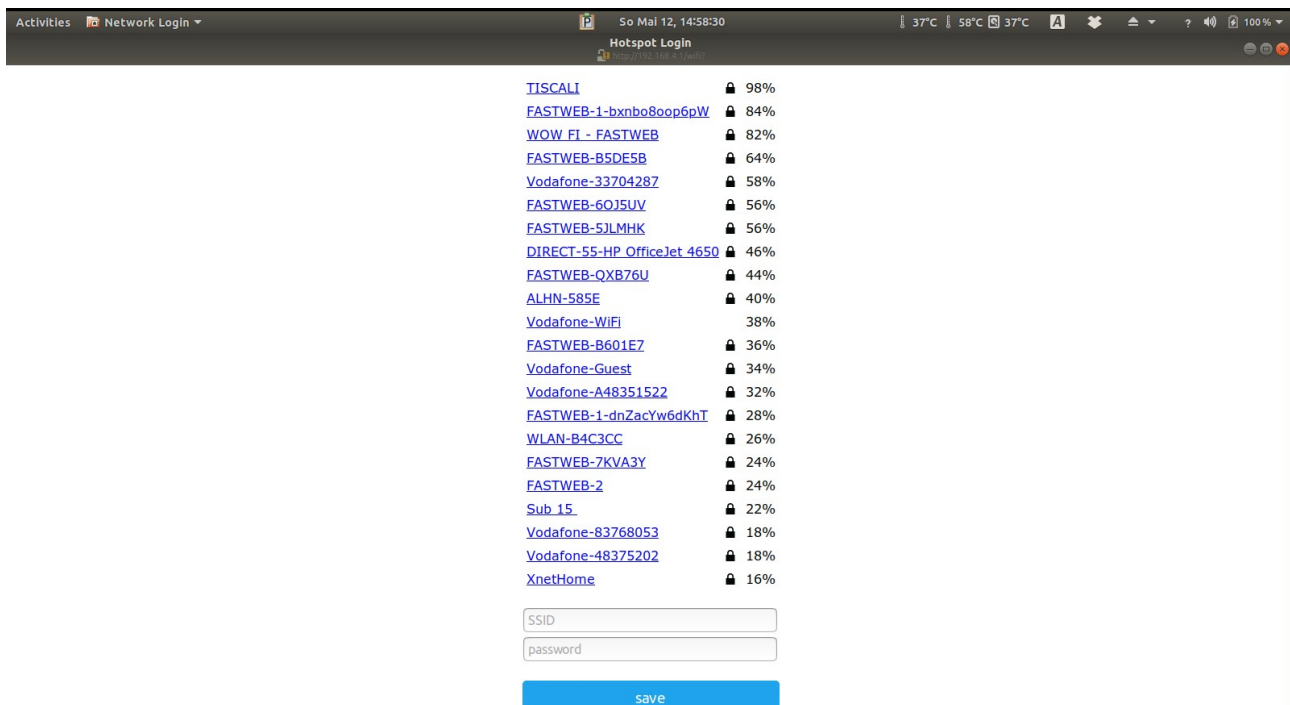
Select the network you want and enter the password for it.

Note: The network you are using and the password for it will be remembered in your module, and it will try to reconnect to the same network.

If for any reason the module can no longer find the network (for example, you have changed network or moved the clock), it will revert to set up mode when you re-power the clock.

Note: If you want to continue to use the same network, just leave the clock as it is: It will reconnect automatically when the network becomes available once more.

Note: If for any reason you are not asked to go to the captive portal, and you are sure that you are connected, you can also try going to <http://192.168.4.1> instead. Some older browsers are not able to detect the redirect.



When you have entered the information, the page should close and you will get a message saying that the information has been saved.

If you have the module connected to the clock, you should get a time update after a maximum of two minutes. The module will disconnect you from it.

Note: The time you get will be the time in Switzerland! Don't worry, you can change this right away!

How to access the module

Once the module is set up, you will need to log into it to configure the time server and set the configuration of the clock. The module has an in-built web server, and you can configure it (and your clock) using a browser.

The module will receive an IP address from your router, and you need to know the address in order to log into the module. The easiest way to find the IP address is to wait for the time update to the clock. When this happens, the WiFi module sends the address you need to the clock, and you can read the address from the clock display.

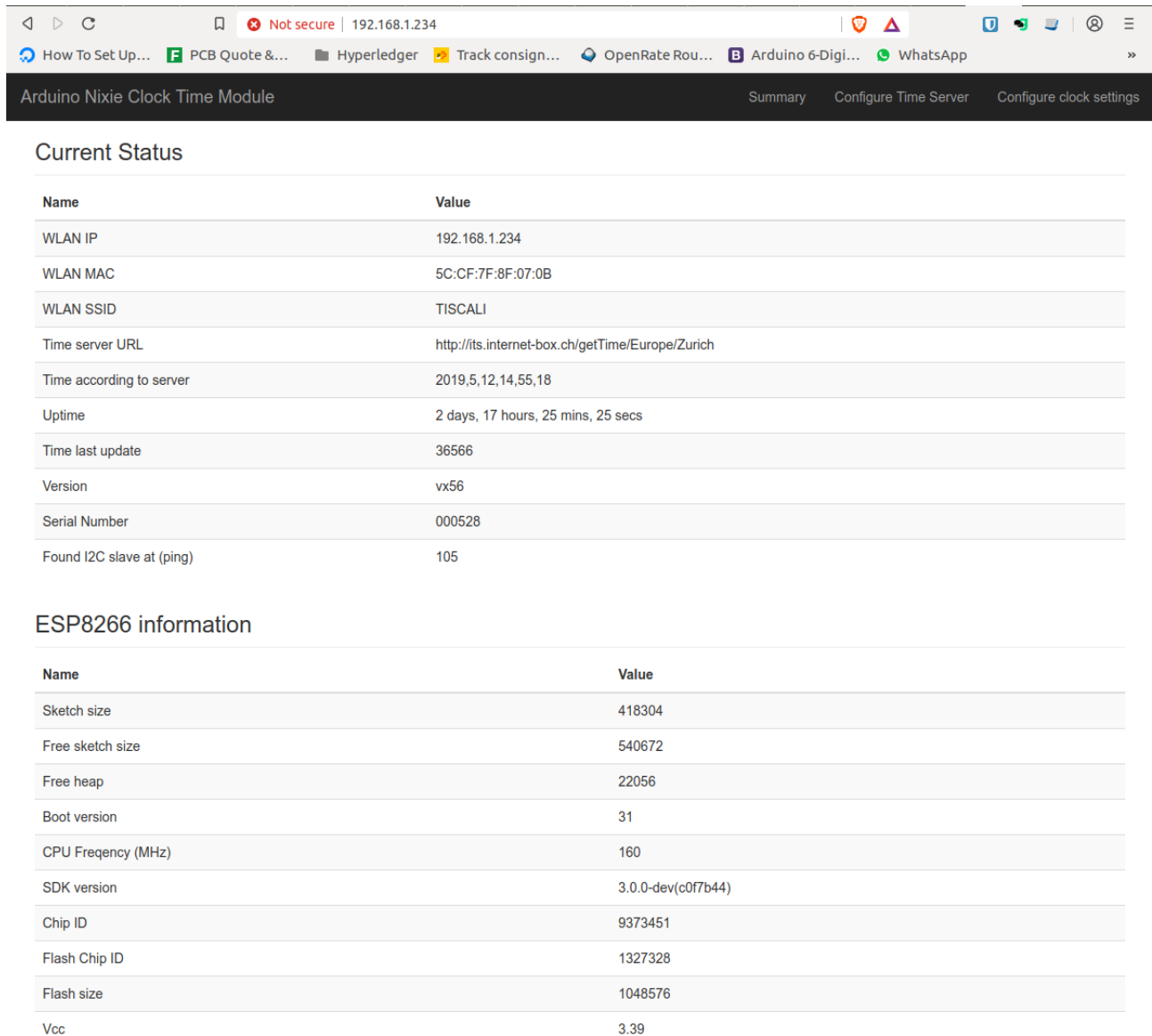
See your user manual for details of how to access the address and read it. The short version is that you can short press the clock button and read the address as it is shown. On 6-Digit clocks you will see something like "19:21:68", then "00:10:47", this means 192.168.1.47. On 4-Digit clocks you will see the same address as "1:92", "1:68", "0:01" and "0:47" (the address is shown as 4 parts instead of 2).

The other alternative is to look on your WiFi router to see the address the module has been given. You should find an entry in the "connected devices" list which starts with "ESP_" with some numbers and letters after it. This is the module, and the IP address assigned will be shown there.

Remember the IP address, or write it down. You will need it to access the module.

Note: If you are on a cable network, it is usual that you will get an address starting with “10” instead of “192.168” (such as “10.10.34.134”). Just follow the same steps but substitute the address you received.

When you have found the address of the WiFi module, you can log into it using any browser. In the example below, the address I saw on a 6-Digit clock was “19:21:68” then “00:12:34”:



The screenshot shows a web browser interface for an Arduino Nixie Clock Time Module. The address bar shows the IP address 192.168.1.234. The page title is "Arduino Nixie Clock Time Module". There are navigation links for "Summary", "Configure Time Server", and "Configure clock settings".

Current Status

Name	Value
WLAN IP	192.168.1.234
WLAN MAC	5C:CF:7F:8F:07:0B
WLAN SSID	TISCALI
Time server URL	http://its.internet-box.ch/getTime/Europe/Zurich
Time according to server	2019,5,12,14,55,18
Uptime	2 days, 17 hours, 25 mins, 25 secs
Time last update	36566
Version	vx56
Serial Number	000528
Found I2C slave at (ping)	105

ESP8266 information

Name	Value
Sketch size	418304
Free sketch size	540672
Free heap	22056
Boot version	31
CPU Frequency (MHz)	160
SDK version	3.0.0-dev(c0f7b44)
Chip ID	9373451
Flash Chip ID	1327328
Flash size	1048576
Vcc	3.39

Setting the time server

Now you can set the time server and time zone by pressing the “Configure Time Server” link at the top of the page.

We provide a time server you can use, but if you want to run your own, the source code is in GitHub at:

<https://github.com/isparkes/time-zone-server>

This is a very simple Node.js application, but the interface is described in the document. There are other ways of getting the time, but we found this to be the easiest.

Our free to use time server is at:

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

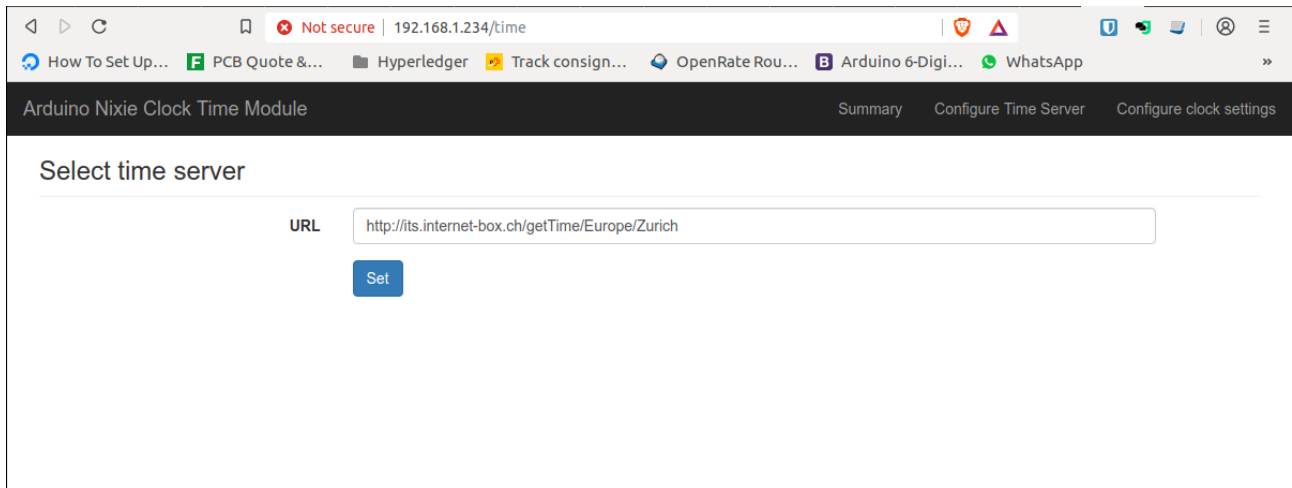
You have to know the time zone you are in. The easiest way is to select the large town nearest to you from the list on this page:

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

I live in Zürich, so I select “Europe/Zurich”. The full URL is:

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

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



Configuring the Nixie Clock

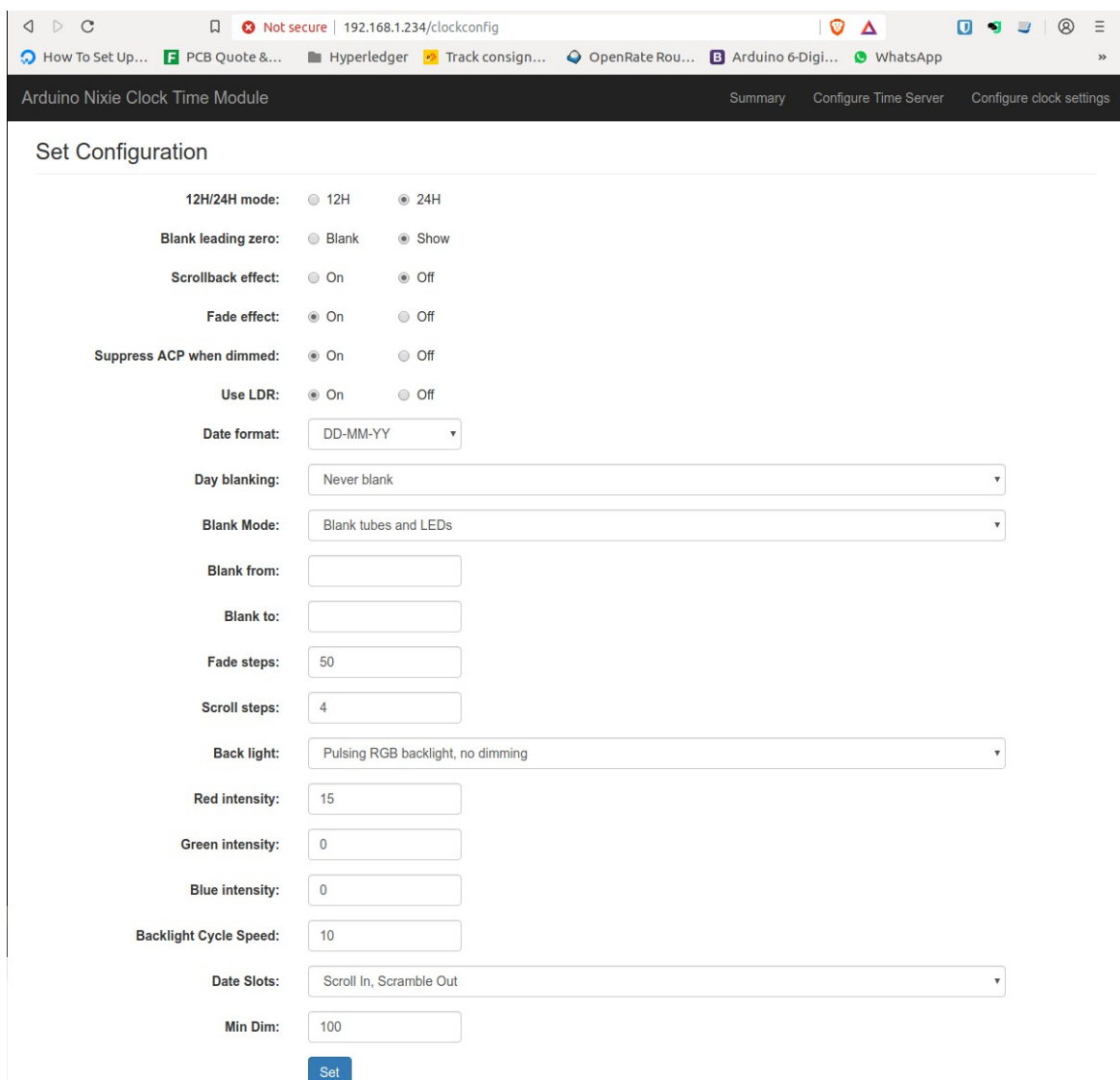
You can also configure all of the usual settings in the clock using the WiFi interface. Only a few very special options are not available in the WiFi interface, and these are not there to avoid people playing around with them, as some are able to damage the hardware of the clock if used incorrectly.

All the frequently used configuration options are available. Please see your clock user manual for a complete description of what the configuration options do.

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 of the configuration settings using the traditional way directly on the clock, if you want to.

The main configuration page looks like this (the V1 firmware is shown, V2 has a few additional options):



The screenshot shows a web browser interface for configuring an Arduino Nixie Clock Time Module. The page title is "Set Configuration". The browser address bar shows "Not secure | 192.168.1.234/clockconfig". The page has a dark header with "Arduino Nixie Clock Time Module" and navigation links for "Summary", "Configure Time Server", and "Configure clock settings".

The configuration options are as follows:

- 12H/24H mode: 12H 24H
- Blank leading zero: Blank Show
- Scrollback effect: On Off
- Fade effect: On Off
- Suppress ACP when dimmed: On Off
- Use LDR: On Off
- Date format:
- Day blanking:
- Blank Mode:
- Blank from:
- Blank to:
- Fade steps:
- Scroll steps:
- Back light:
- Red intensity:
- Green intensity:
- Blue intensity:
- Backlight Cycle Speed:
- Date Slots:
- Min Dim:

A blue "Set" button is located at the bottom of the configuration area.

The Blue Status LED

There is a tiny blue status LED on the Time Module. This gives you a quick check of the status of the module. The LED flashes according to the connection status of the module.

LED Status	Meaning
5 flashes then off for 1 minute	<p>The module is not connected to the WiFi at all and has opened the Access Point to allow configuration. When the module is in this status, you should be able to find the "NixieTimeModule" open network available.</p> <p>It will flash 5 rapid flashes once per minute to tell you it is awaiting set up.</p>
3 flashes at ½ second intervals	<p>Performed once when the module connects to the WiFi with the credentials you have given</p>
Long flash once per second (¼ second on, once per second)	<p>The module is connected to the WiFi, but not to the time server.</p> <p>The "NixieTimeModule" open network will not be available. (In fact it stays open until the module is restarted after initial configuration, but subsequent restarts will close it).</p> <p>You need to connect to the time module and set the time server location.</p>
Short flash once per second (5mS on, once per second)	<p>The module is connected to the WiFi and connected to the Time Server. This is the normal status. The flash is intentionally short because otherwise the blue light can be disturbing in a dark room.</p> <p>The "NixieTimeModule" open network will not be available. (In fact it stays open until the module is restarted after initial configuration, but subsequent restarts will close it).</p>
Fast flash twice per second (¼ second on every ½ second)	<p>The module has lost the connection to the WiFi network. The clock will continue to work, but will not get any time updates.</p>

Note: Updates to the status of the flashing LED can take up to 1 minute to register.

Understanding Security

The module is by design already quite secure. There is no known way of connecting to the open "NixieClockTimeModule" 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 "NixieClockTimeModule" open access point. You can still get into the module configuration through your WLAN, using the IP address that you wrote down earlier.

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 indicate on the tiny blue LED that it is not connected. It will not send any updates to the clock, but the clock will continue to work using it's internal time provider which is not highly accurate.

The "NixieClockTimeModule" open access point will not show up until you restart the clock! This is a security feature to make sure you are in control of when the open access point is available!

The open access point will only turn on after a restart of the clock. It will turn off automatically once it has managed to connect to a network.

Troubleshooting

If not everything goes as you expect, please refer to the test steps during the construction and the associated troubleshooting tips. If that does not cover the problem you have, please see below. If you still can't find the answer, contact us!



Trouble shooting

I can't find the time "NixieClockTimeModule" open network

First check the status of the blue LED on the module. The NixieTimeModule network is only available if the module is in "open" mode.



Trouble shooting

I can't connect to the time "NixieClockTimeModule" open network

This can depend on the device you are using to try and access the module. Not all browsers have the same capabilities, and the module does not have a perfect HTTP stack in it.

Please try connecting with a different device (for example, if you are trying with a PC, try with a tablet or phone instead).

We're always working on improving the compatibility, but experience shows that we are not in a perfect world yet.



Trouble shooting

The module can't seem to communicate with the clock

First check the status of the blue LED on the module. The module needs to be in "configured" mode. This mode is indicated by the blue LED flashing slowly (1 short flash every second).

If the module is fully configured and still does not communicate with the clock, look at the main configuration page for the value for "Found I2C slave at". It should say "105".

If it does say "105", please wait three minutes and see if the time is sent. (The time module sends the time every 60 seconds, and in some cases the module sends the time but it gets missed).

If it does not say "104" please check the connections between the module and the clock.



Trouble shooting

The module is configured, but I don't know the address of it

In this case, you should log into the administrative area of your wireless router and look up the IP address from there. The name of the device will be "ESP_XXXXXX", where the value of "XXXXXX" depends on your module.



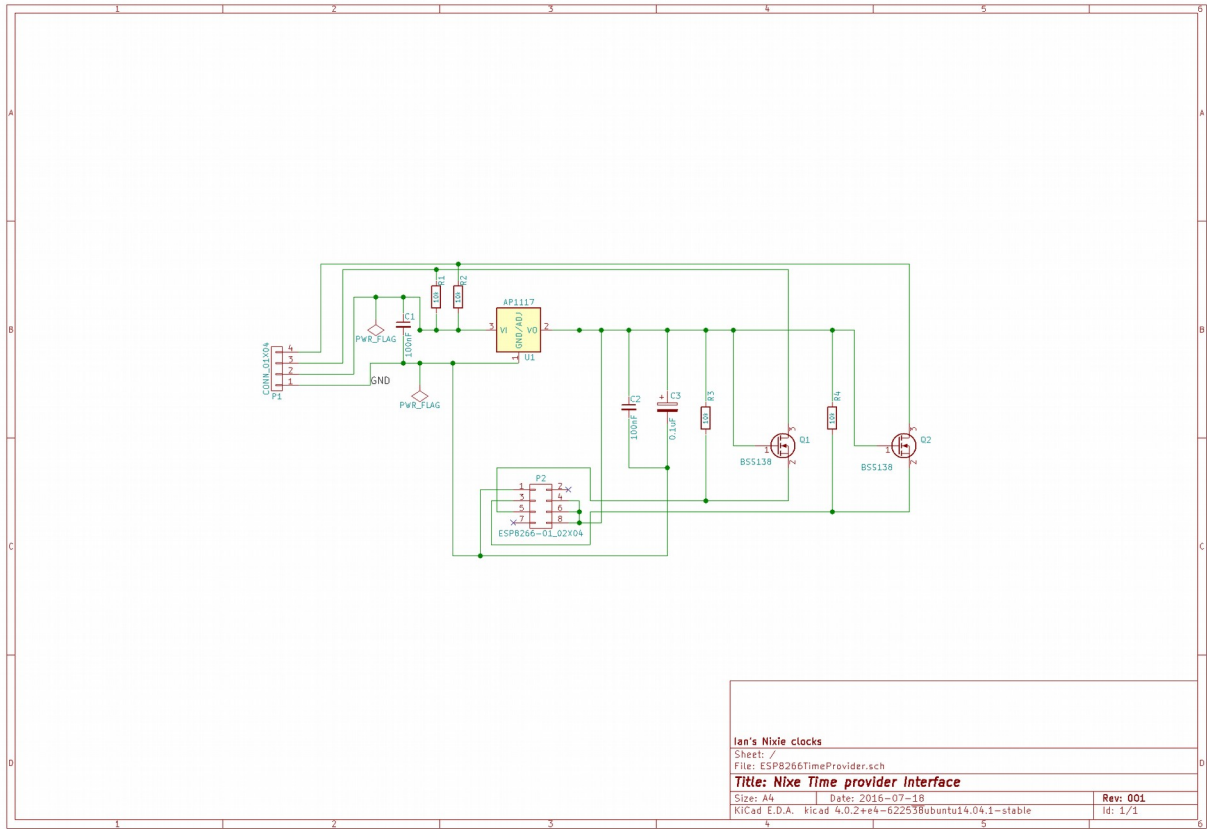
Trouble
shooting

I want to reset the module

There is a reset link available at the address “<http://your-module-address/reset>”. Going to this will reset the module and put it back to the status it was when you first received it.

Schematic

Here is the schematic of the board:



Revisions:

V0001a: 01May2016: Initial version

V0001b: 31May2016: Added information about security

V0001c: 27Jul2016: Added Add schematic

V0002a: 16Feb2017: Added troubleshooting tips

V0003: 12May2019: Update for the new firmware