VFD Clock User Manual

Description

The VFD Clock is a beautiful mix of old and new technology, resulting in a high accuracy, low power clock which will be a talking point in your home.

NOTE: In order to keep such accurate time AND to compensate for Summer/Winter Time, this clock MUST be connected to the internet.

The clock has the following features:

- Highly reliable and **accurate to 1 second in 100 million years!**
- Low power consumption – powered from a single USB power supply.
- All settings are stored in non-volatile memory.
- RGB back lighting allows you to set the tube backlighting colour and intensity.
- Ambient light sensing, with automatic tube dimming, which sets the tube and LED brightness according to the light conditions.
- Configurable time of day blanking, can blank between a start hour and an end hour.
- Atomic time accuracy using a Wi-Fi module to get Internet time
- Battery backed, high accuracy real time clock — for when Internet time is not available.
- Configurable date display (UK or US formats)
- Retains the date and time even when turned off.

What is a VFD tube?

A VFD (or **V**acuum **F**luorescent **D**isplay) tube is a technology from the 1970's. They were originally designed and manufactured chiefly in Russia (and the tubes used in this clock are, indeed, Russian) and used to display data mostly on scientific instruments.

Wikipedia has this to say:

*A **vacuum fluorescent display** (**VFD**) is a display device once commonly used on consumer electronics equipment such as video cassette recorders, car radios, and microwave ovens. LCDs, OLED displays and LED segment displays have now largely replaced VFDs.*

A VFD operates on the principle of cathodoluminescence, roughly similar to a cathode ray tube, but operating at much lower voltages. Each tube in a VFD has a phosphor coated anode that is bombarded by electrons emitted from the cathode filament. In fact, each tube in a VFD is a triode vacuum tube because it also has a mesh control grid.

Unlike liquid crystal displays, a VFD emits a very bright light with high contrast and can support display elements of various colors. Standard illumination figures for VFDs are around 640 cd/m² with high-brightness VFDs operating at 4,000 cd/m², and experimental units as high as 35,000 cd/m² depending on the drive voltage and its timing.[2] The choice of color (which determines the nature of the phosphor) and display brightness significantly affect the lifetime of the tubes, which can range from as low as 1,500 hours for a vivid red VFD to 30,000 hours for the more common green ones.[2] Cadmium was commonly used in VFDs in the past, but the current RoHS-compliant VFDs have eliminated this metal from their construction.

VFDs can display seven-segment numerals, multi-segment alpha-numeric characters or can be made in a dot-matrix to display different alphanumeric characters and symbols. In practice, there is little limit to the shape of the image that can be displayed: it depends solely on the shape of phosphor on the anode(s).

The first VFD was the single indication DM160 by Philips in 1959.[3] The first multi-segment VFD was a 1967 Japanese single-digit, seven-segment device. The displays became common on calculators and other consumer electronics devices.[4] In the late 1980s hundreds of millions of units were made yearly.

Powering On the Clock

When you apply power to the clock it will show a welcome "Hello" message followed by the software release then immediately begin time-keeping at the correct time. This is due to the battery backed real time clock. Until it achieves internet time synchronization, it may be a few seconds from perfect accuracy, but it should be pretty close.

If the clock has been used before and successfully connected to your WIFi, it should connect again within a minute or so.

First time setup

If this is the first time you have powered up your clock (or you use the Utility menu to reset your Wifi settings, or your WifI network has changed) then you will notice that the central tube is a rotating bar WITHOUT a surrounding circle.

This indicates that the module cannot log onto your network (as expected, we haven't told it how to yet!).

The easiest way to connect your clock to the internet and give you all the configuration options is to scan the QR code located on the bottom or side of the clock with a SmartPhone or Tablet. Alternatively, open a web browser on a Wi-Fi connected device and enter the address on the QR code. (This will begin www.ams-tec.co.uk.....). You should then get a web page that will guide you through the process of setting up the clock.

If you use the method above, you can ignore the rest of this manual up to "Clock Configuration" (Page 7).

Alternatively, follow the instructions below:

1. From a mobile phone, Laptop or tablet **with Wi-Fi,** go to your Wi-Fi network selection page.
2. Find the network "VFD_Clock" and connect to this (No password),
3. Once connected, your phone or tablet may complain that it has no Internet connection and suggest reverting to your previous network — **do not do this**.
4. Open a web browser and enter the following address http://192.168.4.1
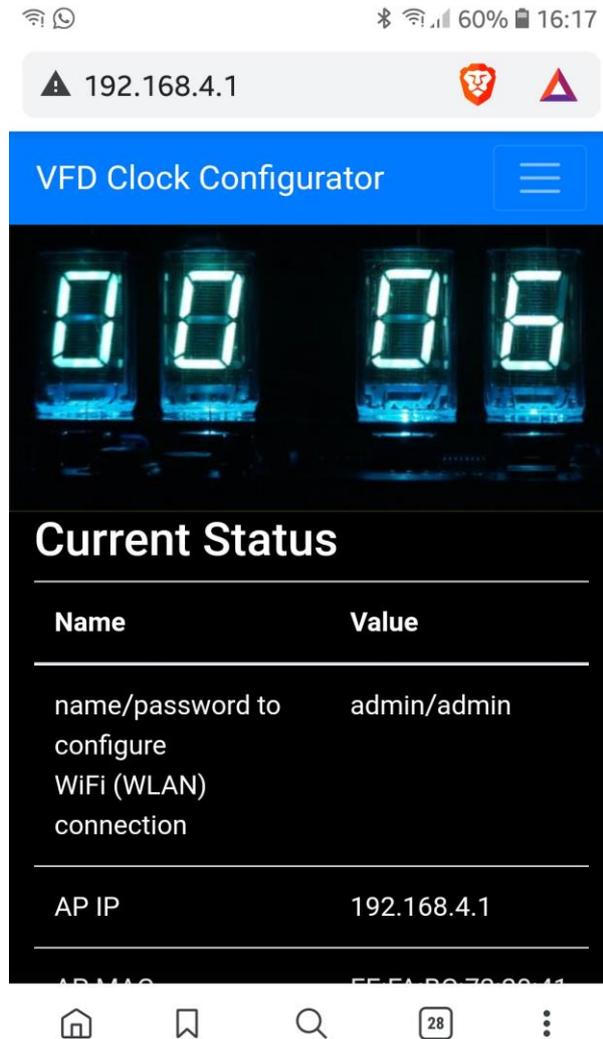
5. Select WLAN from the top menu (Click the top right icon to expand the menu if you are on a mobile browser).
6. You will be asked for a login and password – these are both "admin".
7. From the drop down menu, select your WiFi network name and enter the password.
8. Press "Set".

    At this point, after around a aminute, you should see central tube showing a rotating bar with a surrounding circle. This indicates you have successfully connected to the internet.

9. **On your phone or tablet you can now go back and select your default Wi-Fi network.**

10. **Wait for about 2 minutes**
11. Power OFF the clock.

12. Power ON the clock and wait 1 minute for the clock to connect to your WiFi.
13. Now, from any computer, tablet or phone connected to your network you can setup the clock.
    There are FOUR methods to do this.
    Methods 1 to 3 are easy but may not work in all circumstances.
    Method 4 will always work but it's a bit more involved.

Method 1: (QR Code Method – only for phones and tablets)

Using your mobile phone or tablet you will need to use an app that can read QR codes.
Note that many modern iOS or Android phones and tablets will scan QR codes directly from the camera app.
Simply read this QR code on the back of the clock OR enter manually the web address (it will be in the form "www.ams-tec.co.uk/clocks/XX-XX-XX-XX-XX-XX.html"

If a web page doesn't launch automatically you may need to set the options for your QR code reader app to do this automatically.

Method 2: (mDNS mode – works on all Apple devices, a little more effort on Windows or Android)

Method 2 relies on a feature which is standard on all Apple products (iPhones, iPADS, MAC) but needs an extra bit of software to work on Windows or Android.
Basically, when your clock powers up it "advertises" itself by name on you network. Apple products can see this name on the network natively.

On an Apple product:
In your web browser simply enter the address: **http://clock.local**

On Windows:
You will need to install (if you don't have it already) Apple's Bonjour application.
Go here **https://support.apple.com/kb/dl999?locale=en_GB** and install it.
Then do the same as above for Apple products.

On Android:
On Android you will need to install the "Bonjour Browser" from "wellenvogel" (there may also be others).
Launch this application and click on the link that shows "clock".

Method 3:

Method 3 is MUCH more involved and you will only need to do this if none of the previous methods work.

You will need to know the **IP address** that has been assigned to the clock. There are many ways to do this but the simplest is to download (Android phone or i0S) the app "FING -Network scanner".

In FING, refresh the "Devices" list and look for an item showing the MAC Address printed on the bottom of the clock:
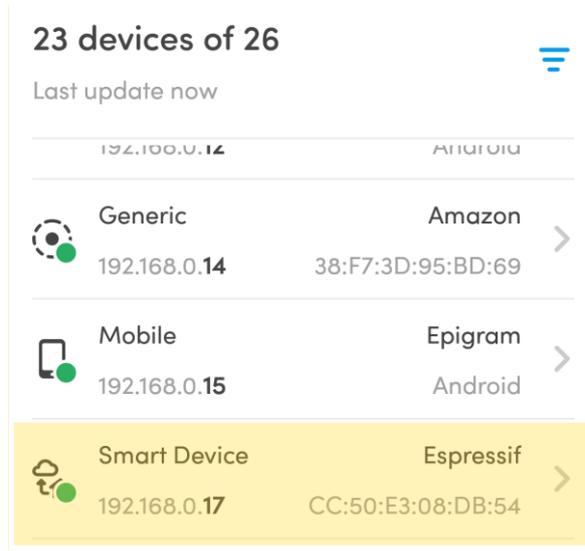
What we are interested in is the 4 sets of numbers to the left of the MAC address, in this case it is 192.168.0.17 but yours will certainly be different from this.

Write down this sequence of numbers.

This address should not change so long as your clock remains powered. In fact, it probably won't change even after a power cycle but, if it does, you will need to repeat this step in order to discover the new IP address, should you wish to change a clock setting.

If you are an advanced user, I advise you to set the MAC address of this clock as a STATIC IP address in your router.

Open up your web browser and point it to the IP address you wrote down just above.

Clock Configuration

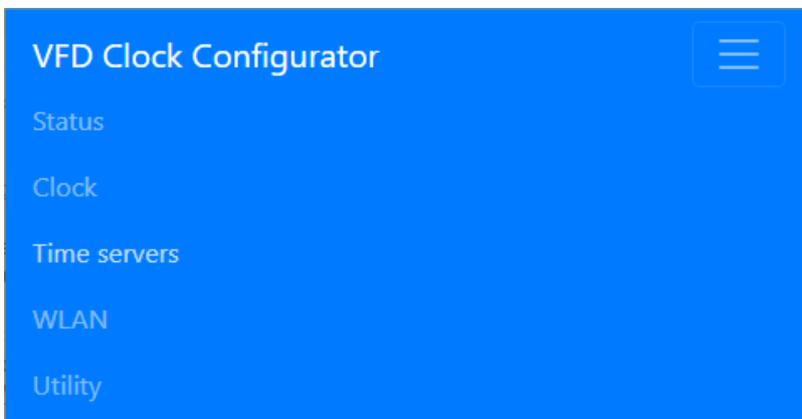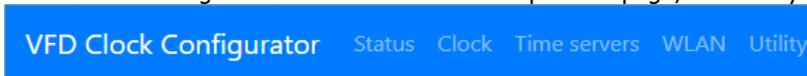You will also see navigation buttons either at the top of the page, or when you click on the menu icon on a mobile browser:

14. Click on "Clock" and you will be asked for a login and password. **The login and password are both "admin".**

Now you should see the main clock configuration page:
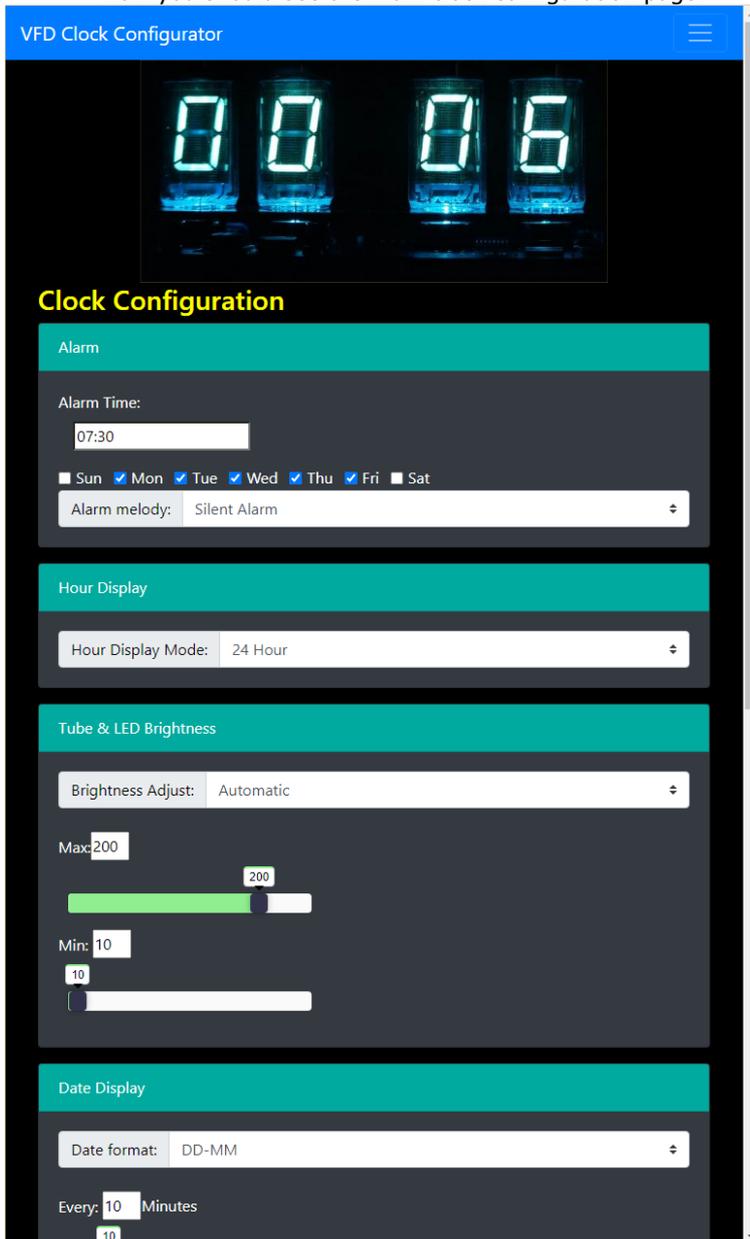
The things you can set here should be mostly self-explanatory but, taking each one in turn:

Clock settings

a. **Alarm Time:** Selecting and day of the week will enable the Alarm Time window. Either click on this window and use the drop down to select an alarm time or simply type in the desired alarm time.
From the drop down menu select either an alarm tune or the silent flashing LED alarm.
b. **Hour Display:** Select 24 Hour display or 12 hour with or without leading zero.
c. **Tube and LED Brightness:** The brightness of the tubes and LEDs can either be set to change with ambient light (with a maximum and minimum value) or set to a fixed brightness.
d. **Date Display:** The date can be displayed automatically every few minutes. Set the number of minutes or set 0 to never display date. You can also set the date format (UK or American format).
e. **Blanking:** You will probably either want to set this to "Never Blank" or to "Blank selected hours every day". If set to "Blank selected hours every day", youuo can then set the "Blank from" and "Blank To" times in the same way as setting the Alarm Time (a).
Finally you can choose whether to blank the tubes and LED's, just the tubes or just the LEDs.
f. **LED Back Light:** This is the brightness setting for the colour LEDS at the bottom of the tubes (backlighting). Play with these values until you like the effect.

Notes:

No changes are made until you press the "Update Clock Settings" button.

All settings are non-volatile, they will be retained even if the clock loses power.

Normal Displays

When in normal time display the clock indicates if it is connected to internet time or not.

Normal time display with centre rotating "seconds" indicator.
Note that the outside "0" shows that the clock is connected to internet time.

Normal time display with centre rotating "seconds" indicator.
Note that the lack of the outside "0" shows that the clock is NOT connected to internet time.

Care of your clock

Your clock should last for many years but, as with all sensitive electronics, you need to be gentle with it. The tubes, in particular, are glass and will break if too roughly handled.

Keep the outside clean with alcohol wipes or similar.