

8 digit internet connected display (loaded with NTP clock firmware)



1) Completed unit in an example enclosure

Introduction

This unit is a universal 8 digit internet connected display which could be used for a number of things but in this documentation it is loaded with firmware to display the time from the NTP time service. This works by connecting over WiFi to the global time server to synchronise the built in software real time clock with the Network Time Protocol. Daylight saving time is handled by a push button switch to turn DST mode on and off when needed.

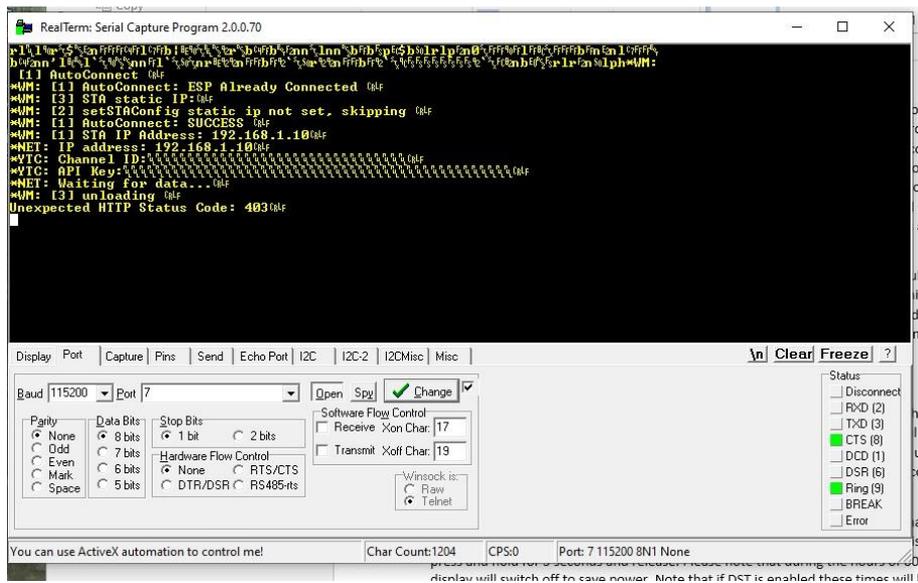
If you have purchased one of these from my Ebay store thanks for your purchase and enjoy your LED clock. You can contact me for support at adrian-smith31@clara.co.uk if you need any help with it.

Technical stuff ☺

The counter works by connecting to the internet through an ESP8266 WiFi module which has a 32 bit RISC-V CPU onboard running at 80Mhz with some spare flash space for user programs which can be programmed in C++ or Python. This is where the firmware for operation is stored. An ICM7228 display driver chip handles the multiplexing and display blanking and drives 8 common anode high efficiency displays directly without the need for current limiting resistors.

Operation

When the unit is configured and first powered on it will do a brief display test (show 88888888) followed by 8 dashes indicating it is connecting to the WiFi network. If successful it will then show the last two octets of the local IP address then go directly to the clock display. If unsuccessful it will show **-HELP-** to indicate it cannot connect to the network or the network isn't configured. You can check the serial diagnostic output (see below) for troubleshooting if required.

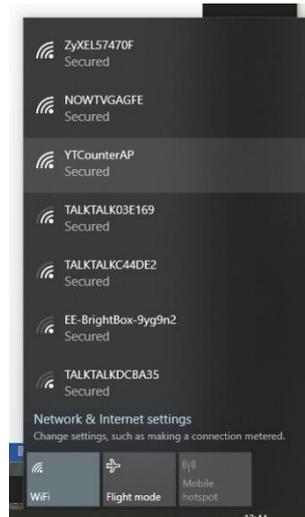


2) Example diagnostic output showing an error. In this case YouTube credentials not set.

A button connected to the 3 pin connector on pins 1&2 enables / disables daylight saving time. To toggle DST on and off briefly press the button. There is a serial port on the unit through the built in RS232-USB converter so if you connect the unit to a computer and open a serial terminal there will be diagnostics and other information sent to the terminal. Serial settings are 115200,8,N,1. You can use a terminal emulator program such as Realterm (pictured) or terraterm. You can also use the Arduino serial monitor with the appropriate ESP8266 support added to the Arduino IDE.

Set-up procedure

Now it is time to connect your clock to the internet. This requires a WiFi connection on the 2.4Ghz band (5Ghz is not supported) and operates with the wireless-N standard. Power up your display and wait till it shows –HELP–then you will need to grab a smartphone or tablet and connect to the new wireless network “inetclock” and when prompted for the password / network key enter “password” all lower case. It is much easier on a smartphone but it can be done with a laptop too. If using your laptop disconnect from your existing connection and connect to the inetclock network. If you are not directed automatically to a WiFi configuration page go to IP address 192.168.4.1 in your favourite web browser.



3) WiFi network SSID

In the left example I used a Windows 10 system it is showing YTCOUNTERAP highlighted but you want to select inetclock. Connect to the network and you will be taken to a web page at 192.168.4.1 (if not manually enter the IP into your web browser) and click on configure WiFi. If any existing networks are configured they will be shown below the blue configuration buttons. When you have clicked on configure WiFi you will be taken to the screen below which shows a list of detected wireless networks in range. If any existing network configuration is set it will look like the example below but obviously it will show a different SSID to mine otherwise on a new device the boxes will be blank. Click on your WiFi network in the list and it will automatically fill in the SSID box. If not, type it manually into the box.

Then once you have done that enter your WiFi router's password (also called passphrase or network key on some routers) and click save. The device will restart and the inetclock access point will disappear and if successful at connecting the clock will show the current time or 00-00-00 if the NTP server didn't respond in time. If that happens it will auto sync on the hour or you can reboot the device to try again. If the display goes back to –HELP—check that you have entered your wireless network password / passphrase correctly.

NOWTVGAGFE	📶
Virgin Media	📶
VM3373790	📶
TALKTALK03E169	📶
EE-Hub-E6qE	📶
TALKTALKDCBA35	📶

SSID

Password

Save

Refresh

Not Connected to ZyXEL57470F

4) WiFi config screen

Troubleshooting

- 1) *The display is blank* – There is no power or insufficient USB power supply current.
- 2) *Clock shows 00-00 or incorrect time* – the NTP server is down or access to it is being blocked by your firewall or network configuration. If it is an hour out DST is active. Press and hold the rear button for 5 seconds then release to turn it off.
- 3) *Not secure is shown on the configuration pages* – This is normal as the web page is not on the internet; they are local web pages stored on the ESP8266 firmware.
- 4) *The device reboots randomly* – USB power supply is insufficient. Please make sure that the USB power supply can supply at least 700mA.
- 5) *Will not connect to WiFi* – Insufficient USB power, incorrect WiFi credentials, WiFi interference.
- 6) *The display shows –HELP—and will not boot* – Not connected to the WiFi network. Check it is working or configured correctly. Check the serial diagnostic output for further troubleshooting.