Theremino **System**



# Theremino NetModule

## Programming via USB

# Firmware compilation

The firmware for the **_Wemos D1 Mini_** is compiled from source files (currently in the "MasterESP8266 (0.14B1) .zip"), which are downloaded from **_this page_**.

The compiler creates four files with the following names:

```
boot_v1.7.bin
esp_init_data_setting.bin
user1.4096.new.6.bin
user2.4096.new.6.bin
```

Both the USB programming application (ESPFlashDownloadTool_v3.4.4.exe), that the WiFi programming application (NetModule Programmer), could use files with these names, but for clarity, after they have been compiled, we rename them as per the following table ( possibly also by adding the version or the footnotes):

```
boot_v1.7.bin              ---> BootLoader.bin  (Or BootLoader_V1.7.bin)
esp_init_data_setting.bin  ---> Params.bin      (Or Params_V2.bin)
user1.4096.new.6.bin       ---> Firmware1.bin   (Or Firmware1_V3.bin)
user2.4096.new.6.bin       ---> Firmware2.bin   (Or Firmware2_V3.bin)
```

The latest versions of the four files (Bootloader, Params, Firmware1 and Firmware2) have been prepared, in the "Firmware" folder of the latest version of the application "NetModule Programmer", which you download from **_this page_**.

The application "NetModule Programmer", in the "Advanced mode", has a page "USB Programmer", which serves to unite the four files in four (1 Mega Byte) files, and also in a single (4 Mega Byte) file, with the following names :

```
FlashAtOffset0x000000.bin
FlashAtOffset0x100000.bin
FlashAtOffset0x200000.bin
FlashAtOffset0x300000.bin
FlashComplete.bin
```

To program via USB we recommend using the single "FlashComplete" file, which is written to location zero, and that covers the whole ESP8266 memory.

# NetModule of programming via USB

The "Net Module," or even just a "Wemos D1 mini", require a first USB programming. Here are instructions for programming the easy way.

- ❖ Download the "Flash Download Tools (Windows PC)" from ***this page***
- ❖ Extract the RAR file in any folder on your PC
- ❖ Locate the application "ESPFlashDownloadTool ..... exe"
- ❖ Copy the "FlashComplete.bin" file near to "ESPFlashDownloadTool ..... exe"
- ❖ Launch the application "ESPFlashDownloadTool ..... exe"
- ❖ Press the first button at the top "ESP8266 DownloadTool"
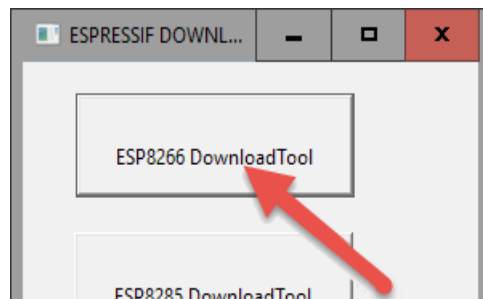


- ❖ Check that at the top is selected "SPIDownload"
- ❖ Press the first button with the dots and select "FlashComplete.bin"
- ❖ Write a zero in the box to the right
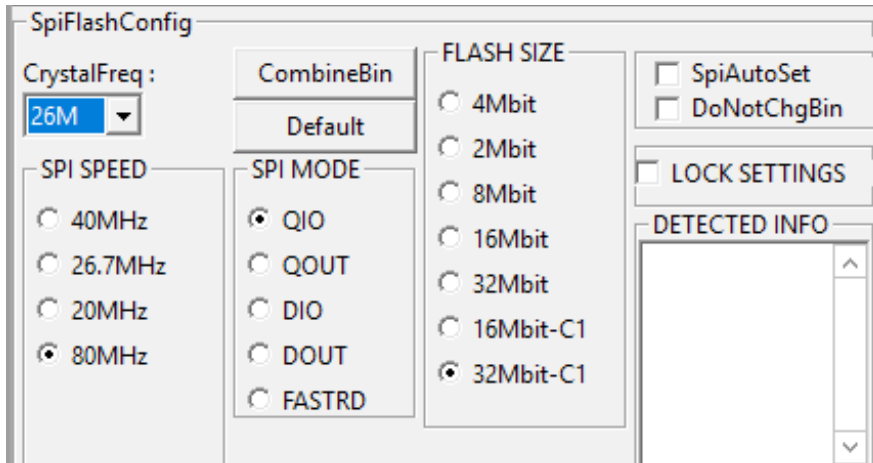- ❖ Enable the square to the left (if everything is ok the line turns green)
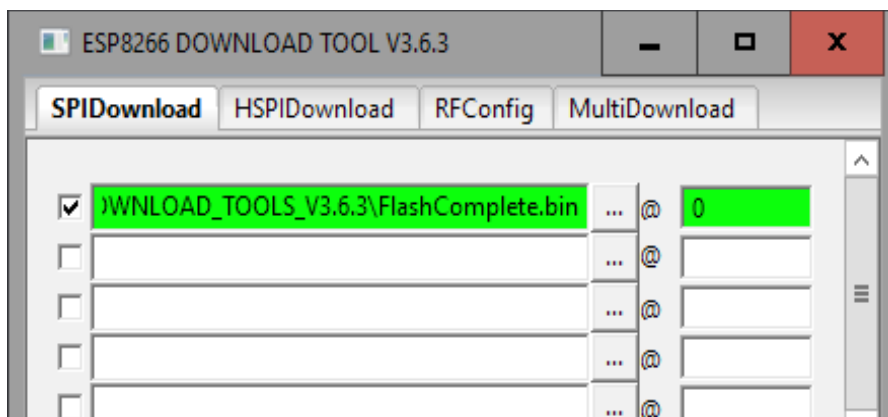
◆ Check the options in the central area "SpiFlashConfig"

CrystalFreq = 26M
SPI SPEED = 80MHz
SPI MODE = QIO (with some non-Wemos modules must be selected DIO)
FLASH SIZE = 32Mbit-C1 (C1 is important, do not use other modes)
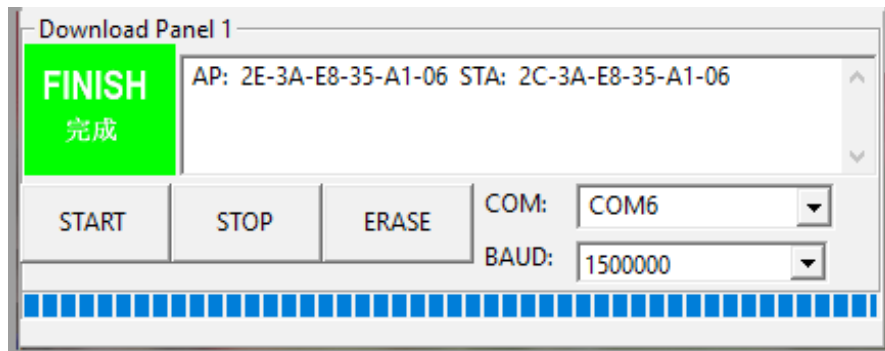


◆ In the lower zone select BAUD = 1152000

◆ Select the COM port where the module is connected (to locate disconnect and connect the module to the USB, and each time open up the com list to see which port disappears and reappears).
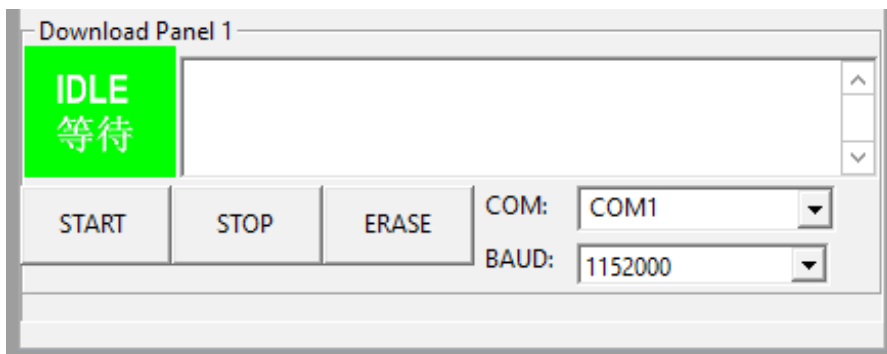
◆ Then press the START button, and wait until the blue bar fills completely.



◆ Close the "Downoad Tool" from his "X" in the upper right, and not by the "X" which is located on the black box. Otherwise you lose all the arrangements made and the next time you will have to redo them.

At the end of the ESP8266 it will remain in the programming state. So you will have to press the reset button on the module, or disconnect and reconnect it to the power supply.

After the USB programming, the module automatically go in the SoftAP state, and every time you reboot it will be SoftAP, until we configure them differently, with the application "NetModule Programmer".

# Modules in SoftAP

After being programmed via USB, or after they are turned on with D0 held high (3.3V or 5V), the modules are in the SoftAP (Access Point Software) state.

You can then connect to them with any computer (or laptop or Tablet) that has a WiFi module.

The modules in SoftAP (Access Point Software) appear in the list of networks as "PTP_xxxxxxxxxxxxx".
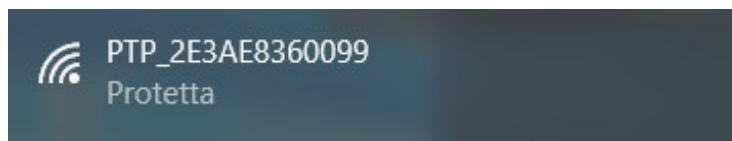


The connection will require a password and you will have to write "password".

Then you will be asked "Do you want to allow a PC to be identified ..." and you will have press the "Yes" button.

The connection will be of type "On-line - Without Internet"
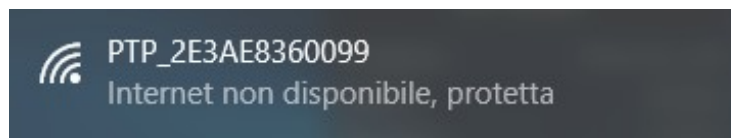


At this point you can open the NetHAL, to use the module directly, or the NetModuleProgrammer, to configure it.

# Connect to the module with the NetHAL

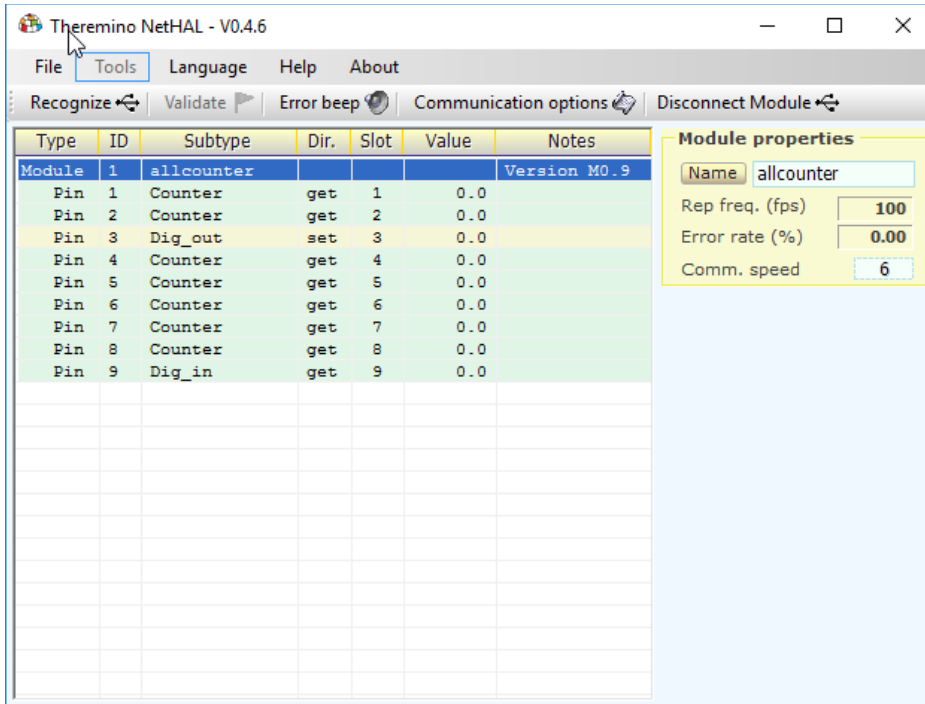When the module is in "SoftAP" you can connect directly to him, without the need for an additional AccessPoint that provides the bridge between the modules and PC.

You can then open the NetHAL and use it directly.



In SoftAP mode you can use the module in all its functions, but only one module at a time.

Wanting to connect multiple modules simultaneously, you have to program them in "Station DHCP" or "Static Station", with the application "NetModuleProgrammer".

If the module does not appear on the NetHAL list, should read page *If the module does not appear in the lists*.

# Connect to the module with NetModuleProgrammer

When the module is in "SoftAP" state you can connect directly to it, without the need for an additional AccessPoint that provides the bridge between the modules and PC.

You can then open the NetModuleProgrammer to configure the module.
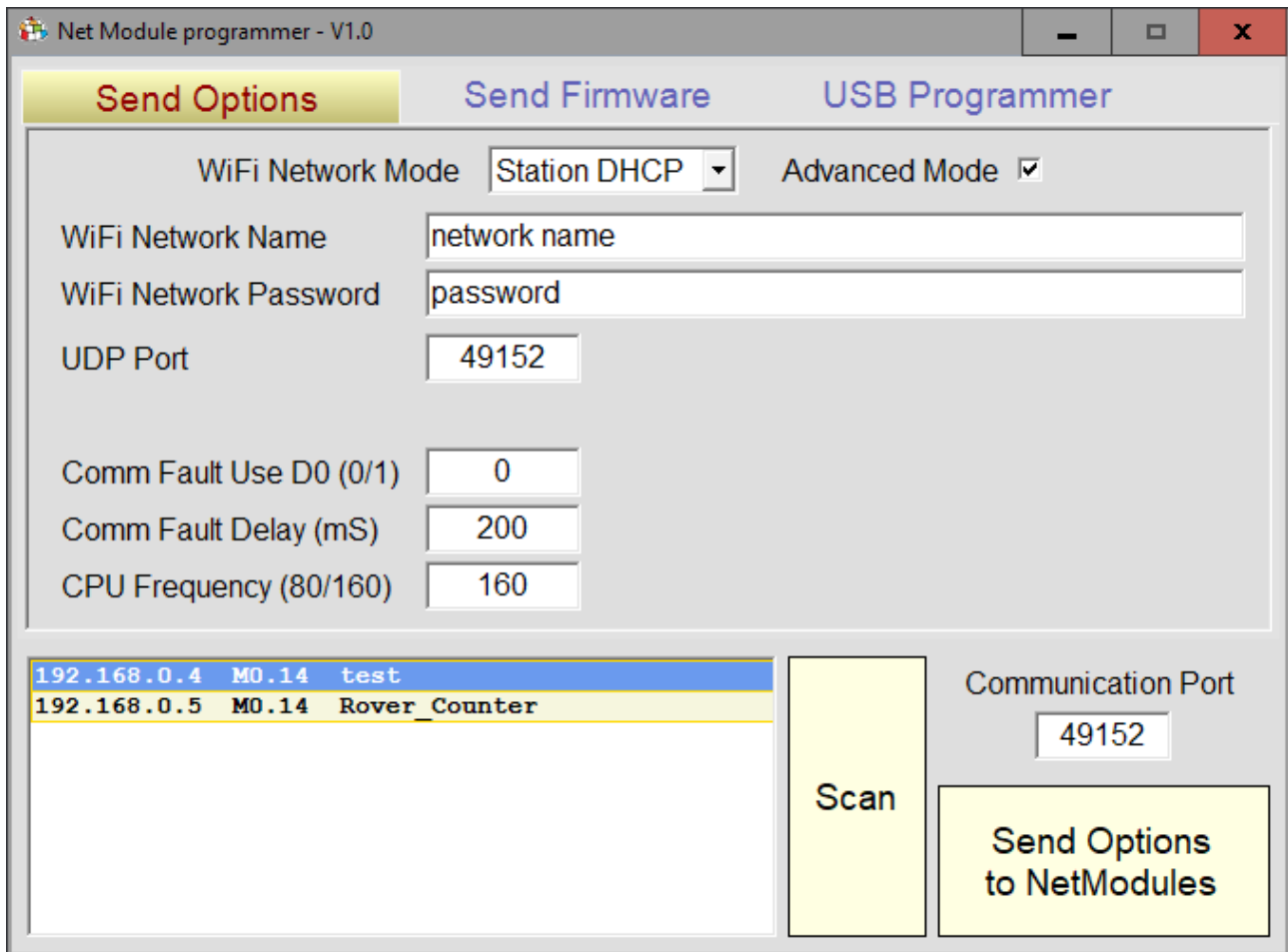


The different operating modes (SoftAP, Station DHCP and Station Static) are explained in the "NetModuleProgrammer_Help" document, which you download from *this page*.

If the module does not appear in the list of modules, we recommend you read the page *If the module does not appear in the lists*.

# Show debug data coming from the serial

It is not necessary to view this data. We recommend that you try it with NetHAL or NetModuleProgrammer and use these methods only if there were any problems.

**Show debug data**

- Since it has been programmed via USB, the NetModule should already be connected to a USB port

- Start the *Theremino Terminal* application

- Select the same COM port that is used for programming

- Set on the Terminal application the speed at 74880.

- Press the reset pushbutton on NetModule, or send a letter R

- Read the incoming lines in the "Receive monitor"

- If necessary, copy everything that comes in and analyze by an expert
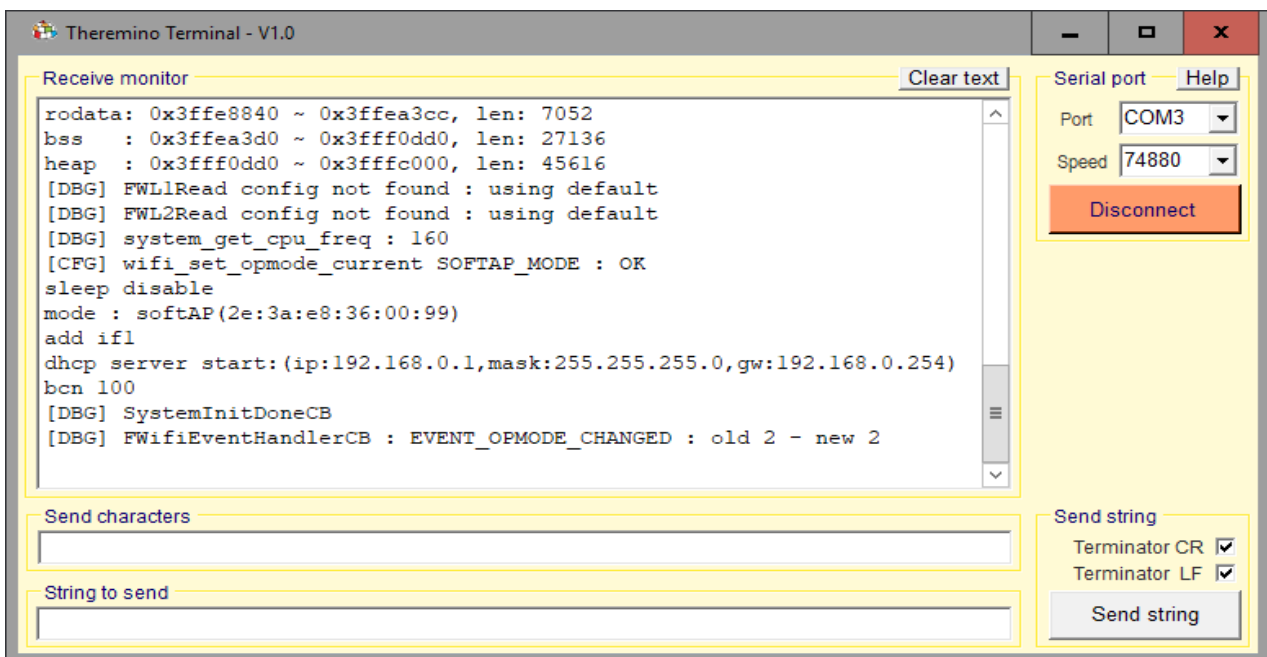


In addition to the letter "R", which resets the module, you can also send an "E" to book SoftAP mode at next start. Or the letter "F", *che imposes the next reboot in StationDHCP mode, with the NetworkName "NoName", and the NetworkPassword "!! NoName !!"*, And therefore allows to connect the module to an AccessPoint immediately, without going through the SoftAP mode.

On the next page you can see what the firmware answers, when it is properly programmed.

# Example of debug data without errors

These are the data that is displayed by the Terminal application, when you press the Reset button.

```
ets Jan 8 2013, rst causes: 2, boot mode: (3.7)

load 0x40100000, len 2592, room 16
tail 0
chksum 0xF3
load 0x3ffe8000, len 764, room 8
tail 4
chksum 0x92
load 0x3ffe82fc, len 676, room 4
tail 0
chksum 0x22
csum 0x22

2nd boot version: 1.7 (5d6f877)
SPI Speed: 80MHz
SPI Mode: QIO
SPI Flash Size & Map: 32Mbit (1024KB + 1024KB)
jump to run user1 @ 1000

rf cal sector: 1019
freq trace enable 0
RF [112]: 00
RF [113]: 00
RF [114]: 03
w_flash

S [DBG] system_upgrade_userbin_check: UPGRADE_FW_BIN1
[DBG] system_get_rst_info: 6
[DBG] firmware version: M0.14
[DBG] system_get_chip_id: 00360099
[DBG] system_get_boot_version: 7
[DBG] system_get_boot_mode: 1
[DBG] system_get_cpu_freq (80)
[DBG] wifi_get_macaddr STATION_IF: 2C3AE8360099
[DBG] wifi_get_macaddr SoftAP_IF: 2E3AE8360099
date : ~ 0x3ffe8000 0x3ffe883a, len 2106
oiled: 0x3ffe8840 ~ 0x3ffea3cc, len: 7052
bss : ~ 0x3ffea3d0 0x3fff0dd0, len: 27136
heap : ~ 0x3fff0dd0 0x3fffc000, len: 45616
[DBG] FWL1Read config not found: using default
[DBG] FWL2Read config not found: using default
[DBG] system_get_cpu_freq: 160
[CFG] wifi_set_opmode_current SoftAP_MODE: OK
disable sleep
mode: SoftAP (2e: 3a: e8: 36: 00: 99)
add if1
dhcp start server: (IP: 192.168.0.1, mask: 255.255.255.0, gw: 192.168.0.254)
bcn 100
[DBG] SystemInitDoneCB
[DBG] FWifiEventHandlerCB: EVENT_OPMODE_CHANGED: 2 old - new 2
```

Given that it is just programmed, the module starts in SoftAP mode, and this is seen in the eighth row from the bottom "`SoftAP_MODE: OK`".

# Example of debug faulty data

In this case the firmware has not been programmed, becuase a memory writing error.

```
 ets Jan 8 2013, rst causes: 2, boot mode: (3.6)

load 0x40100000, len 2408, room 16
tail 8
chksum 0xEF
load 0x00000000, len 0, 0 room
tail 0
chksum 0xEF
load 0x00000000, 0 len, room 8
tail 0
chksum 0xEF
csum 0xEF
csum err
ets_main.c
```

In the second to last line you read "`csum err`", then there was a parity error and the memory is not programmed properly.

A badly programmed module does not starts and its LED behaves in a strange way, after the reset flashes continuously or remains always on.

# If you can not communicate with the module

On some computers, you may not be able to communicate with NetModule through the USB port.

**Symptoms**

1. The operating system signals an error when you connect the USB cable.

2. By connecting the USB cable does not appear a new COM port.

The communication with the NetModule passes through a CH340 chip, which converts the data from USB to serial. This chip needs a special driver, which in some computers may be missing.

In these cases it solves the problem by installing the driver manually.

**Download and install the Windows drivers**

This is the official page of the manufacturer "Quin Heng Technology" for downloading the driver, for all types of CH340 (CH340G, CH340C, CH340B, CH340E, CH340T, CH340R, CH341A, CH341T, CH341H).

The driver is valid for operating systems Windows 10/8.1/8/7/VISTA/XP and Server 2016..2000/ME/98, both 32 and 64 bit, and certified by Microsoft Digital Signature.

*http://www.wch.cn/download/CH341SER_EXE.html*

To install the driver

◆ *Open the page by clicking on the link above*

◆ *Press the blue button "DOWNLOAD"*

◆ *Wait for the download to complete*

◆ *Click the CH341SER.EXE file*

◆ *Agree to the changes*

◆ *Press "Install"*

# If you are unable to program the module

**Symptoms**

1. After having planned (and reset) the module does not appear in networks like PTP_xxxxxxxxx.

2. Resetting the module while connected to the terminal via USB, you see a few lines, probably with a parity error (CKSUM ERR) in the last lines.

```
ets Jan 8 2013, rst causes: 2, boot mode: (3.6)
...
...
...
chksum 0xEF
csum 0xEF
csum err <-------- ERROR
ets_main.c
```

Some non-original modules have a different method of connection between the processor and memory, and you can not program them.

In these cases, you should try setting DIO, instead of QIO, and reprogram the module. Possibly, but it has never yet been necessary, you could also try options: QOUT, DOUT and FASTRD.
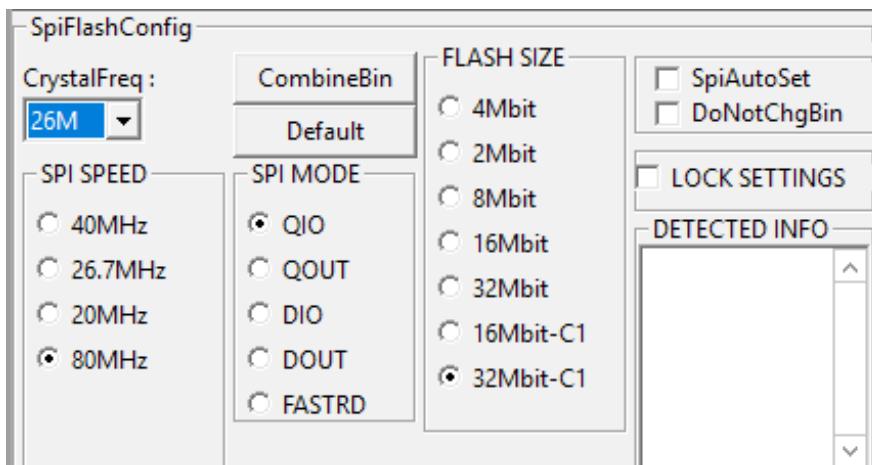


Never change other options (26M, 80MHz and 32Mbit-C1), especially the 32Mbit-C1 must always be there.

Otherwise it could happen that the modules, as well-planned and well-functioning, stop working as soon as you program them with the application "NetModule Programmer".

# If the module does not appear in the lists

## Symptoms

1. The module appears in the list of networks, but then does not appear in the lists of NetHal and NetModuleProgrammer

2. The module connects to the WiFi network, but then does not appear in the lists of NetHal and NetModuleProgrammer.

Sometimes the network may be in an abnormal state, some say it is due to the Proxy, or it could be due to misconfiguration of the firewall rules.

We recommend that you perform the following sequence:

◆ Click on the Windows Search box (bottom left).

◆ Write CMD and wait for it to appear "Command Prompt".

◆ Click it with the right mouse button and choose "Run as administrator."

◆ Copy the following two commands one by one and give ENTER to all them

**`netsh int ip reset`**

**`netsh winsock reset`**

◆ Try again if the modules appear on NetHAL (starting it, or by pressing "Recognize").

◆ If they do not yet appear, try to make a restart

◆ If they do not yet appear, try also the following command (that completely reset the firewall and therefore may block some programs).

**`netsh advfirewall reset`**

As an alternative to the command "**`netsh advfirewall reset`**" you could follow as explained in "Theremino_NetModule_Firewall Problems" file, which you download from *this page*.

# Program the firmware only

You must do this if you want to update the firmware only.

You just select the two Firmware1 and Firmware2 files.
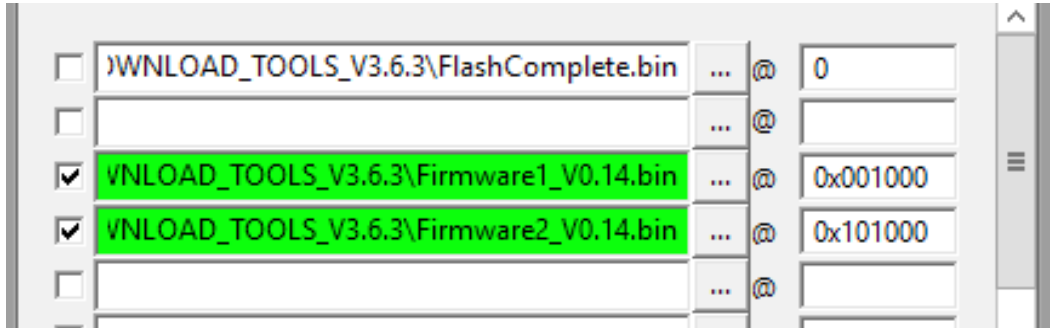


And then proceed as explained in the pages *__NetModule of programming via USB__*.


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You can not always just upgrade the firmware. Some new versions may be incompatible and require a total renovation.

So it's usually good to write the "FlashComplete.bin" file, whose only drawback is to require a longer development time (40..50 seconds vs. 10 seconds).


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At the end the ESP8266 it will remain in programming state, and you will have to press the reset button, or remove and restore power.


Having just reprogrammed the firmware, the module will restart in the previous state (SoftAP, Station DHCP or Station Static).

# Program many modules simultaneously

When programming modukes in the factory, may be convenient to reduce the programming time.

Using the "Multi Download" you can program multiple modules simultaneously and significantly reduce the programming time.
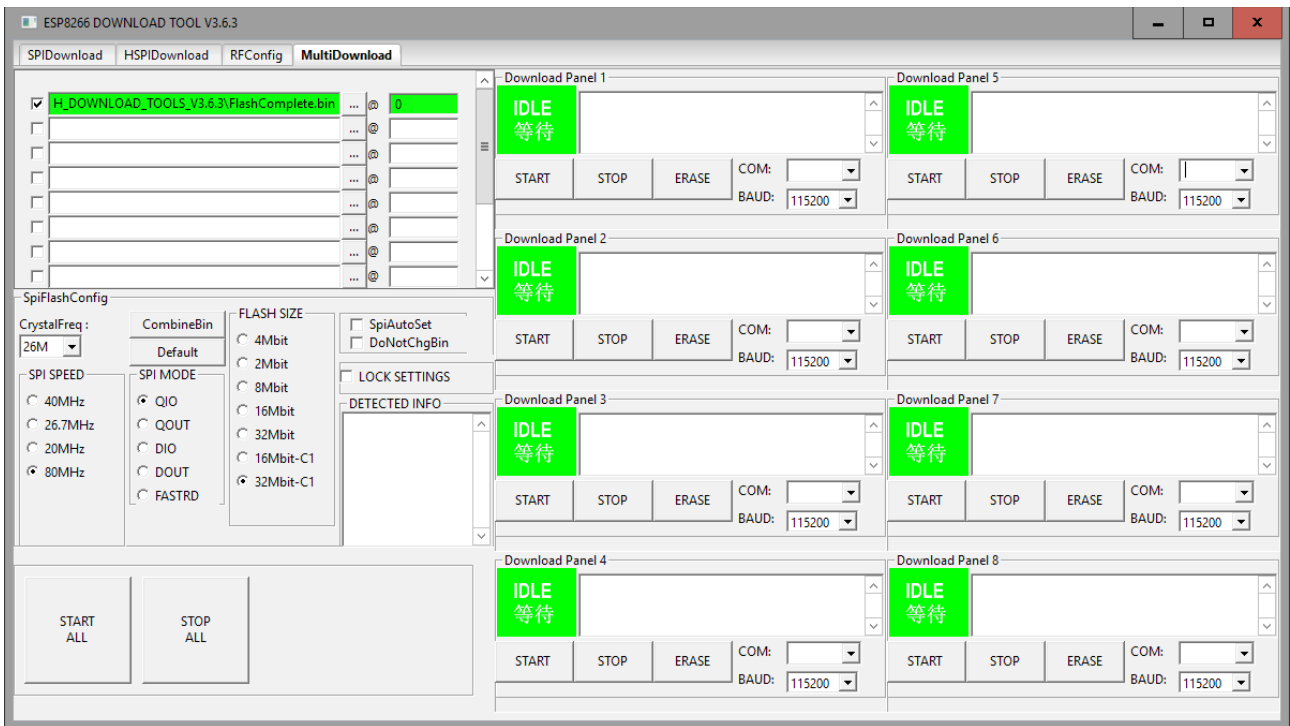


- Use a USB HUB with eight ports and configure the eight COM ports
- Connect four modules to the first four ports, and press the four relative "Start"
- While the first four modules are programming, replace the four others and press "Start"

With a little 'training you can almost multiply by eight the programming speed and program more than 500 modules in an hour.

Note that when you open the Multi Download page for the first time, the baud are 115,200, and if you do not change them to 1,152,000 programming will be very slow.

You can also try to increase the speed to 1,500,000, that on some systems works without errors and reduces the programming time from 50 to 40 seconds.