APPLE-1 WI-FI MODEM

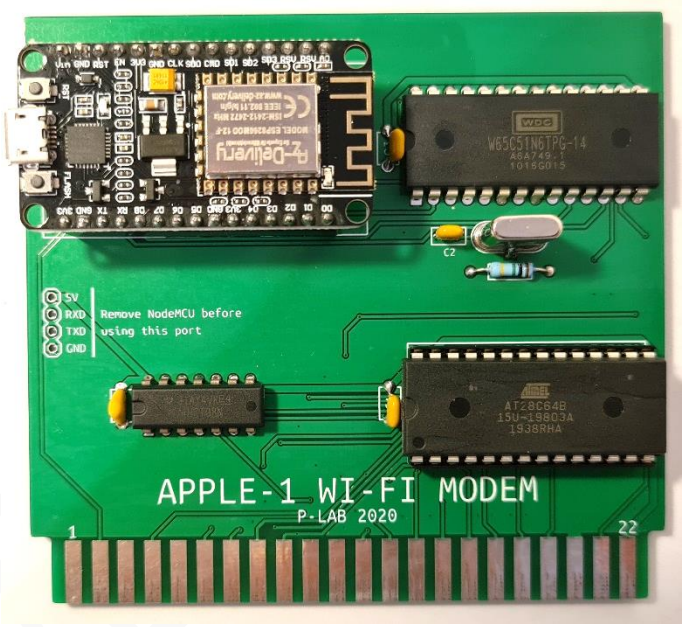
v1.0

Apple-1 Wi-Fi Modem is an electronic board that allows you to connect via TELNET protocol a great number of BBSes (Bulletin Board System) on the internet.

It will give you the opportunity to have fantastic new experiences using your Apple-1 computer, allowing you to enjoy new media entertainment such as news, online games and much more!

This document contains:

1. Package Contents
2. Risk of electrostatic discharges
3. Product description and features
4. Wi-Fi network configuration
5. Installation of the card
6. Operations and connection examples
7. Console-to-Console connection
8. Final notes



Picture above is for illustration purpose only. Actual product may vary due to due to product enhancement or availability of components.

1. PACKAGE CONTENTS

- *Apple-1 Wi-Fi Modem* board

2. DAMAGES FROM ELECTROSTATIC DISCHARGES

Apple-1 Wi-Fi Modem is sensitive to static electricity, just like your Apple computer, and may be damaged by it. Before any operation on your devices, you must discharge the static electricity accumulated by your body and prevent it from building up again. We do not accept any responsibility for damage, even serious or fatal, caused to people / things / intellectual property during the installation or use of this device.

3. PRODUCT DESCRIPTION AND FEATURES

Apple-1 Wi-Fi Modem is a board (based on NodeMCU ESP866 plus an *Asynchronous Communication Interface Adapter* and a dedicated software) that integrates perfectly with your Apple-1 computer, Original or Replica. The connectivity to the Internet is based on a Wi-Fi modem that will need to be configured to connect to your home network in a few simple steps.

Using your existing Wi-Fi network it will be possible to connect via TELNET to any BBS that supports this protocol. The terminal software, contained in an EPROM/EEPROM memory, is already configured to maximize the throughput of the computer I/O and does not require any additional modification.
Due to the well-known limitations of the computer video interface, the contents will always be displayed always in capital letters and the communication speed will be limited to 600 bit/s (or 600 baud, in this case the definition is equivalent). The firmware of the NodeMCU ESP866 has been specifically modified to manage this speed.
This low speed, however, will ensure a very satisfactory user experience, especially if the BBSes you connect to are compatible with the screen format of 40 columns by 23 lines.
As we will see in the next sections, the only configuration to be made will be the one related to your home Wi-Fi network, for which you will need to know the network name (SSID) and password.

4. WI-FI NETWORK CONFIGURATION

Due to the impossibility of Apple-1 to handle lower case letters, **you should configure your Wi-Fi network access credentials <u>BEFORE</u> connecting Apple-1 Wi-Fi Modem to your Apple-1 computer**.

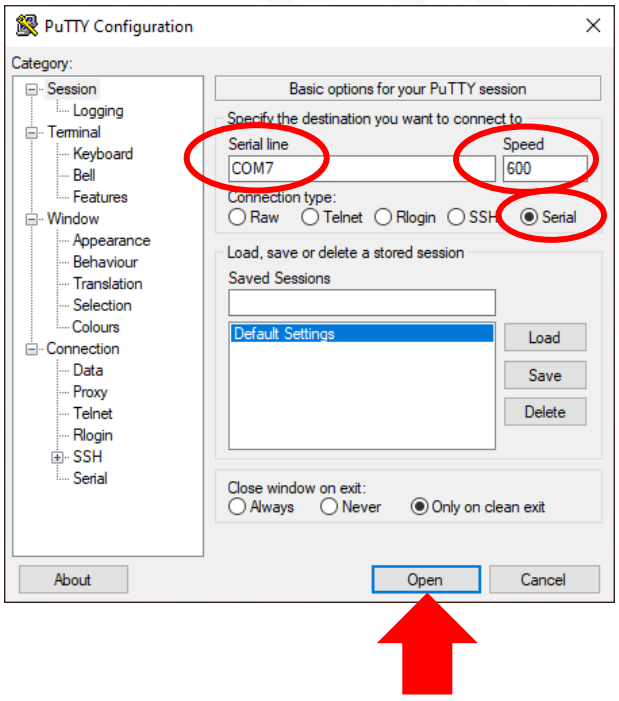
Therefore, carefully remove the actual Wi-Fi modem, avoiding pulling the USB connector, and connect it to your personal computer (Micro-B USB cable not supplied).

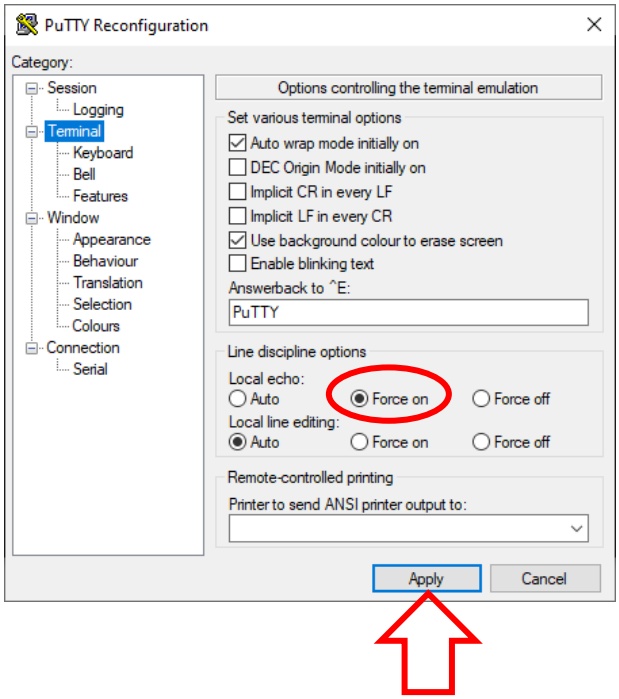
Make sure it is recognized by the Operating System by checking that it appears in the Control Panel Devices, and write down the serial port identification:
In the examples below, the modem has been assigned the COM7 port: you will use the given one.

In Linux environment it could be recognized as device file /dev/ttyUSBx.

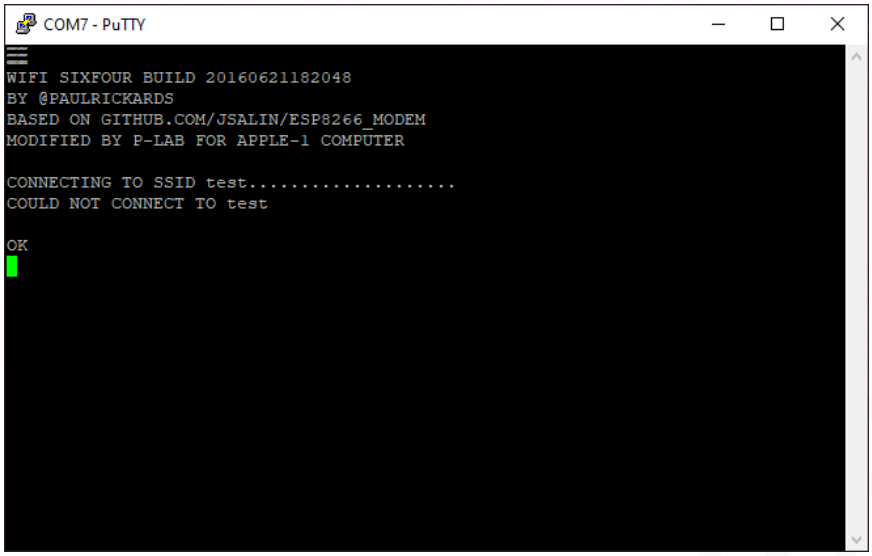
If the modem is not recognized it will be necessary to download the necessary drivers for the chipset CP210x.

It is now necessary to use any terminal program to continue the configuration.
In the example below, PuTTY has been used.
When opening the program, before pressing OPEN, select/modify the indicated fields/options:





When the connection starts pressing the ENTER key and the following will appear:



The welcome message confirms that the Wi-Fi Modem is active and that it has tried to connect, without success, to the Wi-Fi network with SSID "test".

This specific network has been configured during production to test the product and must be replaced by yours.

The "OK" message means that the modem is ready to accept commands.

The modem supports many Hayes AT commands, the main ones are described in this manual.
Each command shown here must always be followed by pressing the ENTER key.

Let's assume that your home Wi-Fi network has SSID:

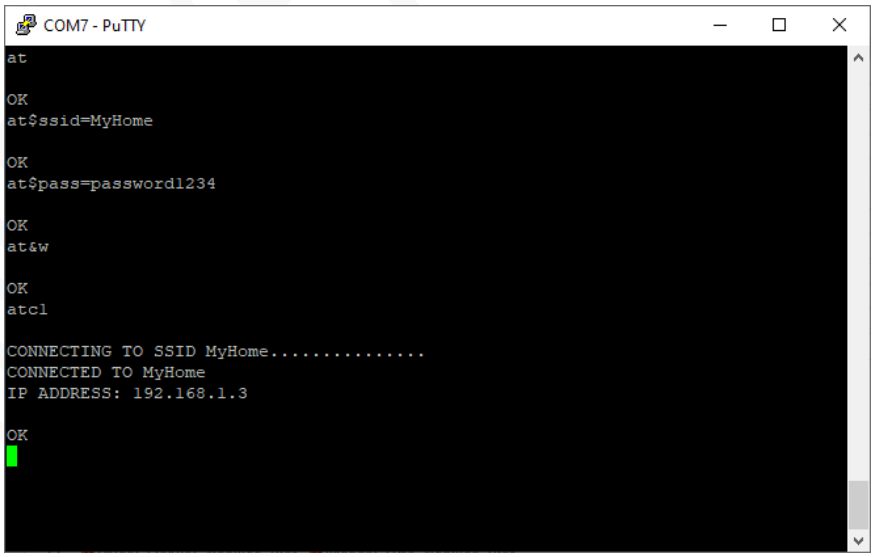
MyHome

and that the password is:

password1234

The commands to be given will be:

```
at$ssid=MyHome
at$pass=password1234
```



The modem will respond with "OK" to each correctly executed command, otherwise "ERROR" will appear.
In this case the command must be re-typed.

Please note: some combinations of capital letters / numbers / special characters may not be eligible as SSID and/or password.
If SSID and password have been correctly stored the next command is:

```
at&w
```

The command stores all the parameters in the non-volatile memory of the Wi-Fi modem. Doing this they will be safe when the device is switched off.

You can now connect to your home Wi-Fi network using the command:

```
atc1
```

If the connection is successful, the message "`CONNECTED TO SSID`" will appear followed by the IP address assigned to the Wi-Fi modem by your router.
You can take this opportunity to familiarize with the Wi-Fi modem, as the commands you give from your Apple-1 will obviously be the same. For example, the command:

```
ati
```

will show you other parameters related to the connection to your home network, while the command:

```
at?
```

will recall the Help menu, along with the syntax of all available AT commands.

Congratulations, the configuration of your modem is complete!

You can now **reassemble it on the Apple-1 Wi-Fi Modem** card by gently inserting it into the slot paying attention to the insertion direction.

Please Note: it is possible that the connection may fail the first time or after a reboot, even if all parameters have been configured correctly. This is normal and is not a symptom of malfunction.

If this happens, just give the `atc1` command again.

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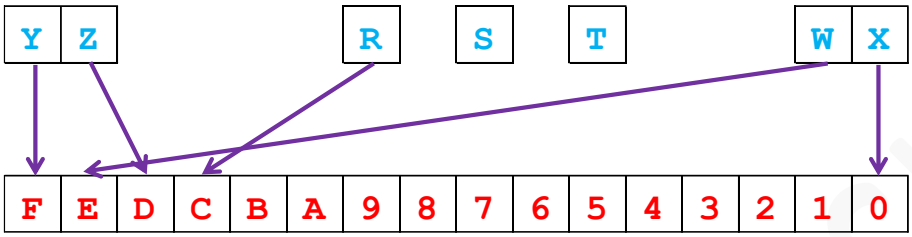
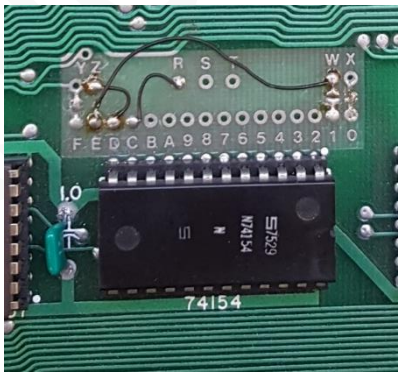
5. INSTALLATION OF THE CARD ON THE APPLE-1 COMPUTER

5.1 INITIAL CHECKS

Apple-1 must be set up with the configuration “WITH ACI”, with the following connections in the CHIP SELECT area:





The diagram and the picture show the necessary connections.

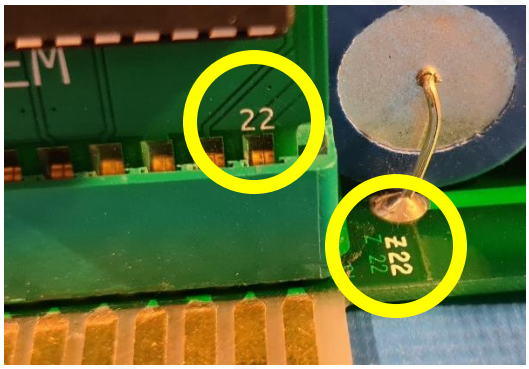
These wirings are quite standards among all the all Apple-1 computers,

both Originals and Replicas.

There is no need to other dedicated wirings.

5.2 INSTALLATION

The card must be inserted as shown in the picture:



The number "22" on the card and the number "22" on the motherboard must be on the same side.

The number "22" on the card must therefore face the outer side of the Apple-1 motherboard.

Using the card in combination with other cards and/or devices such as BUS EXTENDER could lead to malfunctions: do not use this kind of devices.
The *Apple-1 Wi-Fi Modem* card must be the only one present.

WARNING: Switching on the computer with the card oriented incorrectly **INSTANTLY DAMAGES** the computer and the card itself.

6. OPERATIONS AND CONNECTION EXAMPLES

After switching on your Apple-1 computer, press the RESET and CLEAR SCREEN keys as usual.

The *entry-point* of the terminal program (stored on a non-volatile memory) that will allow you to communicate with the Wi-Fi modem is $C000. To run it you will have to give the following command:

```
C000R
```
and press ENTER (from now on indicated with {ENTER})

The following will be displayed:

```
C000: 20
@
```

Now press ENTER one single time.
The same welcome message you saw in the configuration phase will immediately appear:

```
WIFI SIXFOUR BUILD 20160621182048
BY @PAULRICKARDS
BASED ON GITHUB.COM/JSALIN/ESP8266_MODEM

MODIFIED BY P-LAB FOR APPLE-1 COMPUTER
CONNECTING TO SSID the name of your Wi-Fi network .........
CONNECTED TO the name of your Wi-Fi network
IP ADDRESS IP address assigned to the modem by your router

OK
@
```

The Wi-Fi modem tries to automatically connect to the configured Wi-Fi network when it starts up.
If an error occurs: check your home Wireless Router and give again the command to connect:

```
ATC1
```
{ENTER}

If the connection has been successful you are now ready to connect to one of the many BBS and enjoy its services!
You could for example try the "Retrocampus" BBS which has a layout fully compatible with your Apple-1's screen.

It can be reached at the address **bbs.retrocampus.com** port **6502**

The syntax of the command for initiating a connection is as follows:

```
atdt indirizzo:porta
```
{ENTER}

So in our case we will type:

```
ATDT BBS.RETROCAMPUS.COM:6502
```
{ENTER}

The connection will be immediately established and the welcome screen will appear:

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```
WELCOME TO FRANCESCO SBLENDORIO'S
   ____  ____ ____
  ! __ )! __ ) ___\
  !  _ \!  _ \___ \      FOR
  ! \_) ! \_) \__) \
  \____/\____/_____/

           :'
         :;
     __ :__
   .''__'_'__''
  :__________._;
  :__________:        APPLE I COMPUTER
   :__________'_;
    '.__.-.__.'

 2020 IS LIKE 80'S

BBS FOR APPLE I - BY F. SBLENDORIO 2020

BLOG/NEWS                GAME ROOM
-----------------        ---------------
A - TELEVIDEO RAI        R - TIC TAC TOE
B - WIRED ITALIA         S - CONNECT FOUR
C - DISINFORMATICO       T - ZORK 1
D - NEXT QUOTIDIANO      U - ZORK 2
E - MEDBUNKER            V - ZORK 3
F - SPORTAL              Z - HITCHHIKER'S
G - IL POST              . - LOGOUT
H - FATTO QUOTIDIANO
I - SYS 64738
J - RETROCAMPUS
K - RETROACADEMY
L - BUTAC.IT
M - PRO-TEST ITALIA
N - FACTA.NEWS
O - INDIE RETRO NEWS
P - DOTTORE, MA E' VERO CHE...
Q - VINTAGE COMPUTER FEDERATION

>
```

If you want to read some news from the Vintage Computer Federation, for example, press **Q** {ENTER}. The chosen content will appear:

```
VINTAGE COMPUTER FEDERATION

1.VCF SWAP MEET
2.VCFED 2020 T-SHIRTS - LAST CALL!
3.VCF EAST AND VCF BERLIN ARE THIS
  WEEKEND!
4.NOVEMBER REPAIR WORKSHOP AT SYSTEM
  SOURCE
5.CURT VENDEL, 1966 - 2020
6.VCF EAST 2020 VIRTUAL ONLY - OCT 10
  & 11
```

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```
7.VIRTUAL VCF WEST 2020 SCHEDULE
  POSTED!
8.VCF MUSEUM REOPENING AUGUST 1, 2020

# [N+-]PAGE [H]ELP [R]ELOAD [.]QUIT>
```

Usually each page clearly specifies the navigation commands.
To play ZORK 1 you would have to press T {ENTER} from the main page.
The famous text adventure would have started immediately:

```
ZORK I: THE GREAT UNDERGROUND EMPIRE
COPYRIGHT (C) 1981, 1982, 1983 INFOCOM,
INC. ALL RIGHTS RESERVED.
ZORK IS A REGISTERED TRADEMARK OF
INFOCOM, INC.
REVISION 88 / SERIAL NUMBER 840726

WEST OF HOUSE
YOU ARE STANDING IN AN OPEN FIELD WEST
OF A WHITE HOUSE, WITH A BOARDED FRONT
DOOR.
THERE IS A SMALL MAILBOX HERE.

>
```

Another BBS that is definitely worth a visit is: `a80sappleiibbs.ddns.net` port `6502`.
It runs on a real Apple // and has interesting contents.

The contents of each BBS are out of scope of this document and may change at any time.
Today's programming techniques allow the creation of BBS with dynamic and real-time contents, so that you can read for example the latest news, or teletext pages, or chat with friends, or play&save games.
Refer to the many online lists to discover other BBS and the services they offer.
The BBSes mentioned in this document are only intended to briefly illustrate the connection and browsing procedures and are not affiliated or sponsors this product.
At the end of the session, always remember to disconnect from the BBS that hosted you by following the instructions provided, not to occupy its resources unnecessarily.
To return to the WOZ Monitor press the RESET button.

COMPATIBILITY
The Apple-1 computer, as it is known, has only uppercase letters and does not support any commands to position the cursor nor clear the screen.
Therefore, it does not support any ANSI control characters.
The CBM ASCII semi-graphical characters commonly called PETSCII are not supported either.
If the BBS to which you are connected makes use of the above, the result will be a screen full of garbage characters.
Therefore, choose BBSes that provide their service using pure ASCII characters, such as teletype characters, and if you have the possibility to do so, choose a screen format of 40 columns by 23 lines.
Many BBS are "multi-standard" and ask directly to the user what kind of standard have to be used.

7. CONSOLE-TO-CONSOLE CONNECTION

It is possible for *Apple-1 Wi-Fi Modem* to act as a *telnet server* so that it can "answer" calls from external systems. It therefore "listens" on a specific port associated with its IP address.
The port in question can be found using the command:

```
ATI  {ENTER}
```

The page that will appear contains, among other parameters, the information we are looking for:

```
SERVER PORT: 6400
```

Your modem is then listening on port 6400 of your IP address and is ready to receive incoming connections.
From another computer, connected to the same Wi-Fi network, if you initiate a TELNET connection to the IP:PORT of your Wi-Fi modem you will see the message:

```
RING

RING
```

You should 'answer the call' with the command:

```
ATA  {ENTER}
```

From now on you will be in direct connection with the computer that contacted you. Everything you type will appear on the screen of the remote computer, and vice versa.

If the connection from the remote computer fails because Apple-1 is "busy" give the command:

```
ATS0=0  {ENTER}
```

and try again.

For other options, such as setting a personalized message in case of no answer, please refer directly to the modem help that can be called up with the `AT?` command.

Further information about the commands and their parameters, which are not dealt with in this document, can be found at the site indicated in the next section.

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8. FINAL NOTES

8.1 ESP8266 FIRMWARE CREDITS

The original firmware used in the Wi-Fi modem is available here, under the General Public Licence GPLv3:
https://github.com/RolandJuno/esp8266_modem
This software has been modified to operate at the maximum acceptable speed for Apple-1.

8.2 EXTERNAL MODEM CONNECTOR

A connector has been provided to connect the ACIA (*Asynchronous Communication Interface Adapter*) on the card to other modems different from the supplied one.
For this operation it is necessary to remove the supplied modem before using this port.
The logic is TTL and the signals are at **5V**.
The parameter of the connection are: **600** baud, **N**o parity, **8** data bits, **1** stop bit.

8.3 DIFFERENCES BETWEEN TERMINAL 1 AND TERMINAL 2 PROGRAMS

In this document we referred to the terminal program with *entry-point* $C000.
Another terminal program is available, its *entry-point* is $C100 (`C100R` {ENTER} to run it).

The difference between the two is that the second one does not force the local retransmission of what you have typed. This function, called terminal "local echo" can also be managed by the modem itself using the ATE0/ATE1 commands. The operation can be summarized with the following:
`C000R` → terminal “local echo” is active → use `ATE0` to avoid double echo.
`C100R` → terminal ”local echo” is not active → use `ATE1` to get back what you type.
In this last case you may find yourself typing the ATE1 command "blindly". The local echo will appear after pressing the ENTER key.
Depending on how the remote system manages this function, you may therefore receive double echoes of the characters (local+remote) or a double "Carriage Return".

Since there is no real standard on the argument, depending on the BBS to which you are connected, it may be necessary to operate both with commands:
`ATE0` {ENTER} → disable modem local echo (this is the default setting)
`ATE1` {ENTER} → enable modem local echo
as well as the appropriate choice of the Terminal 1/2 program in order to ensure the best user experience.

8.4 DEMO PROGRAM

Due to the great available space on the EPROM/EEPROM memory, the ASCII-ART demonstration program "Forty years of Apple" has been included. To run it from WOZ Monitor type: `C280R` {ENTER} .

We hope you enjoy using *Apple-1 Wi-Fi Modem!*

APPLE-1 WI-FI MODEM

INFO | RFQ | SUPPORT: p-l4b @ protonmail.com

P-L4B @ PROTONMAIL.COM