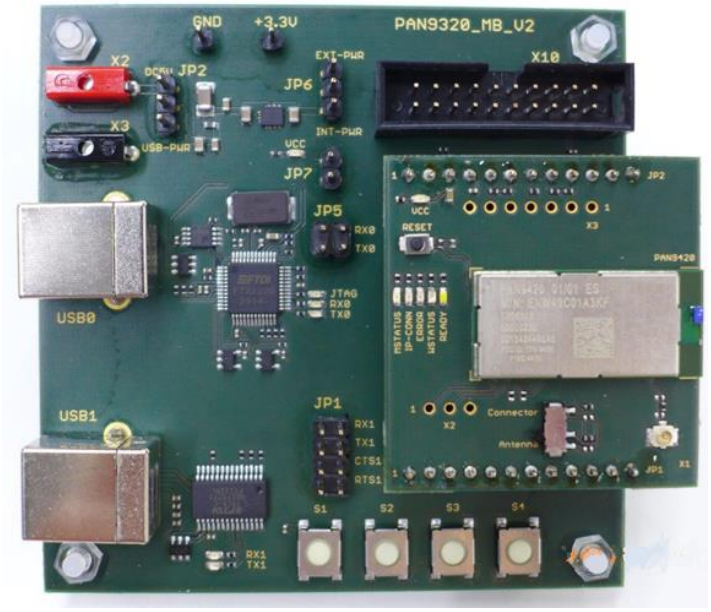
Panasonic

PAN9420

Quick Start Guide

Rev. 1.0



Wireless Modules

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Table of Contents

1 About This Document

1.1 Purpose and Audience

The purpose of this document is to allow new users to promptly orient themselves with the PAN9420 Evaluation Kit, as well as speedily being able to start evaluating and using it.

In this document the PAN9420 Wi-Fi module is synonymously referred to as “PAN9420” or “the module” and the PAN9420 Evaluation Kit as “Eval Kit” or “the Kit”.

The document is intended for design engineers and application engineers who plan to integrate the PAN9420 into their product. However, it is generally useful for anyone wanting to understand the setup of the Evaluation Kit.

1.2 Revision History

Revision	Date	Modifications/Remarks
1.0	15 June 2018	Initial version 1.0

1.3 Use of Symbols

Symbol	Description
	**Note** Indicates important information for the proper use of the product. Non-observance can lead to errors.
	**Attention** Indicates important notes that, if not observed, can put the product’s functionality at risk.
	**Tip** Indicates useful information designed to facilitate working with the software.
⇨ [chapter number] [chapter title]	**Cross reference** Indicates cross references within the document. **Example:** Description of the symbols used in this document ⇨ 1.3 Use of Symbols.
✓	**Requirement** Indicates a requirement that must be met before the corresponding tasks can be completed.
➔	**Result** Indicates the result of a task or the result of a series of tasks.

Symbol	Description
This font	**GUI text** Indicates fixed terms and text of the graphical user interface. **Example:** Click **Save**.
Menu > **Menu item**	**Path** Indicates a path, e.g. to access a dialog. **Example:** In the menu, select **File** > **Setup page**.
`This font`	**File names, messages, user input** Indicates file names or messages and information displayed on the screen or to be selected or entered by the user. **Examples:** `pan1760.c` contains the actual module initialization. The message `Failed to save your data` is displayed. Enter the value `Product 123`.
[Key]	**Key** Indicates a key on the keyboard, e.g. **[F10]**.

1.4 Related Documents

[1] Panasonic. PAN9420 Communication Specification Firmware V1.1.X.X

[2] Panasonic. PAN9420 Product Specification

Please refer to the Panasonic website for the most updated and more related documents and tools.

2 Introduction

2.1 What is in the Box

The PAN9420 Evaluation Kit comes with the following three components:

- The Mother Board (MB)
- The PAN9420ETU (Easy To Use) – Mounted on the MB
- USB Type-B cable

For any further supportive documentation, please use the QR Code on the Box or please refer to the link in ⇨ 6.2 Product Information.

2.1.1 The Mother Board (MB)

The MB consists of the following features and parts:

- Two USB Type-B receptacles
    - USB0: Provides 5V power via USB and the command UART0
    - USB1: Data UART1 (Netcat, Webcat, UDP etc.)
- Jumpers
    - JP2, JP6 and JP7, Set power source
    - JP5 UART0 (RX and TX)
    - JP1 UART1 (RX, TX, CTS and RTS)
- Switches
    - S1: Factory Reset (if held for 10 seconds will invoke)
    - S2: Not Connected
    - S3: WAKE_UP0
    - S4: WAKE_UP1
- Optional External 5V power supply via X2 and X3

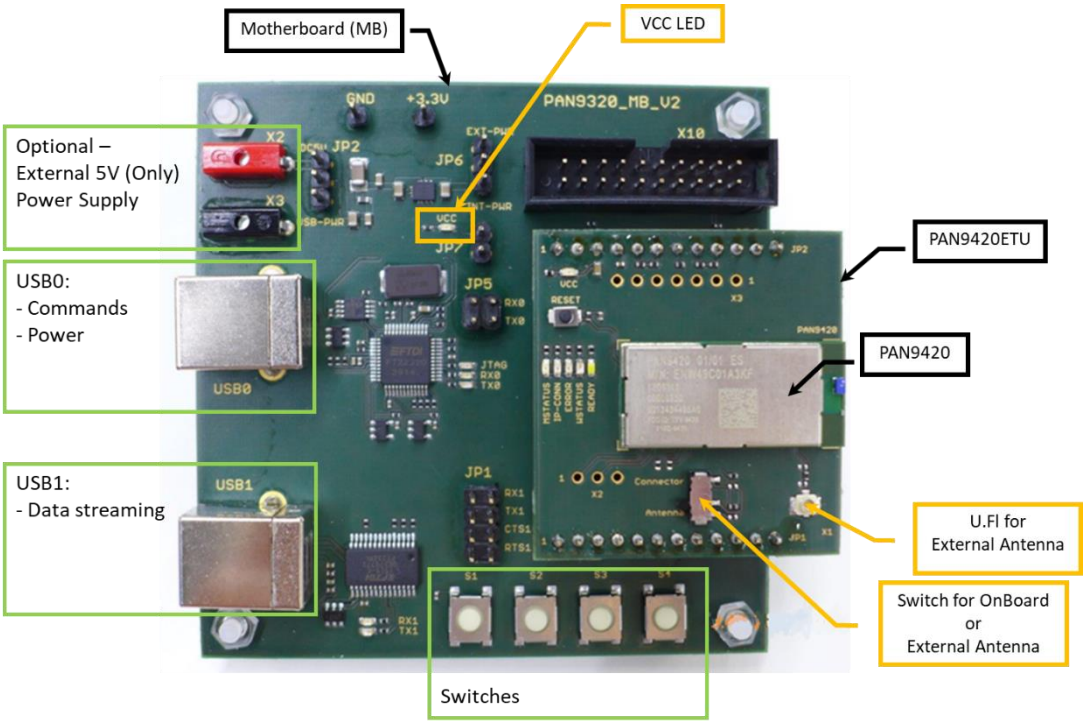


Figure 1: The Evaluation Kit Motherboard (MB)

2.1.2 The PAN9420 ETU

The PAN9420ETU is a daughter board with the module mounted on it. It offers access to: GPIOs, LEDs, U.Fl connector (for external antenna) and an Antenna Selector Switch. Please see ⇨ Figure 2: The Evaluation Kit ETU below.

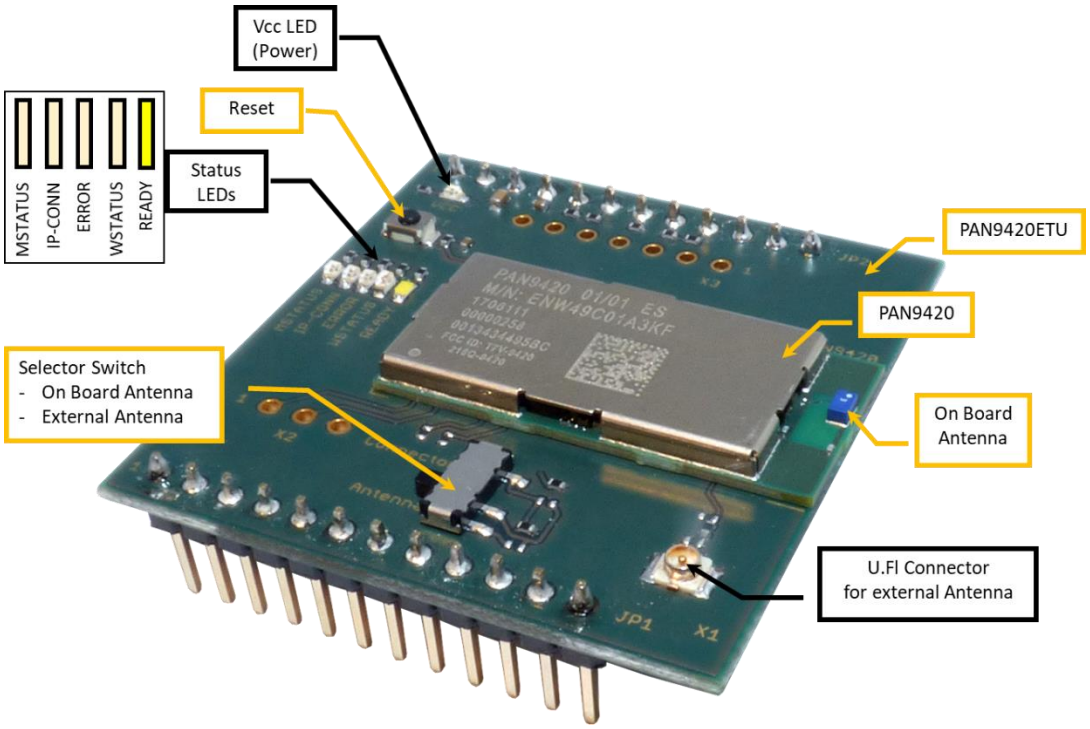


Figure 2: The Evaluation Kit ETU

The ETU comes pre-mounted on the motherboard and can be swapped with other daughterboards. You can order the ETU by itself.

2.1.3 USB Type-B Cable

The USB Type-B cable is provided to connect the Eval Kit to your PC or Laptop. The cable is used for data transfer as well as providing the Evaluation Kit with 5V DC, which can be sourced from your PC or alternatively from an external power source such as a portable power bank.

Figure 3: USB Type-B Cable

2.2 Additional Equipment

To interact with the PAN9420 Evaluation Kit, you will also need:

- A Desktop or Laptop (PC) with a USB port, and the following Software Tools:
  - A **Browser** such as: Chrome, Firefox, etc.
  - A **Terminal** such as: PuTTY, TeraTerm, HTerm, etc.
  - Panasonic's **WIFIgurator** - An integrated SW tool for the PAN9420 Eval Kit.
- Alternatively, you can use a smart device such as a smartphone or a tablet.

> Using a smart device will limit you to an OTA (Over The Air) wireless connectivity as described in ⇨3.2.2 Wireless.
>
> For the most comprehensive evaluation capabilities, you will need to use a PC.

2.2.1 The WIFIgurator

The WIFIgurator is a handy evaluation tool for Windows OS only, provided by Panasonic.
To use the WIFIgurator, please follow the next steps:

1. Download the ZIP file from the download section.

   Europe:

   https://pideu.panasonic.de/products/wireless-modules/wifi/PAN9420-Fully-Embedded-Stand-Alone-Wi-Fi-Module.html

   North America:

   https://na.industrial.panasonic.com/products/wireless-connectivity/wi-fi-modules/embedded-wi-fi

2. Extract the ZIP file.
3. Run `WIFIgurator.exe` from the extracted directory (see Figure 4 below).

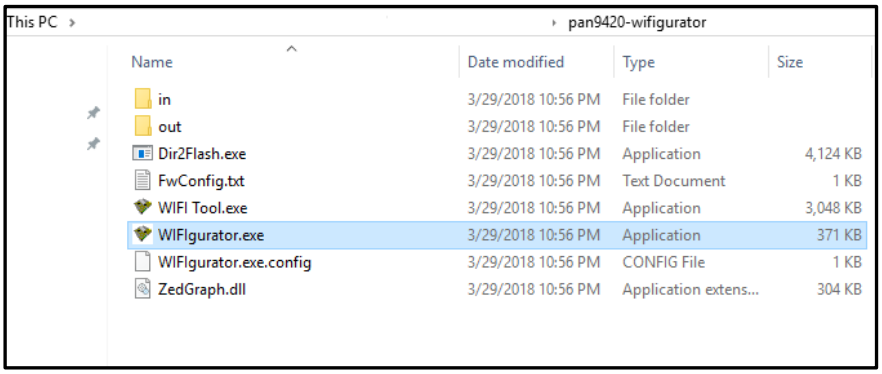


Figure 4: WIFIgurator Directory

3 PAN9420 Overview

3.1 Features

The PAN9420 is an all-inclusive, embedded Wi-Fi module. It contains an integrated IoT-ready web-stack that offers and provides many key IoT features.

For detailed and up-to-date list and description of all available features, please read the `PAN9420 Communication Specification` available in the download section on our website:

Europe:

https://pideu.panasonic.de/products/wireless-modules/wifi/PAN9420-Fully-Embedded-Stand-Alone-Wi-Fi-Module.html

North America:

https://na.industrial.panasonic.com/products/wireless-connectivity/wi-fi-modules/embedded-wi-fi

3.2 Interacting with the Evaluation Kit

The PAN9420 Eval Kit is an evaluation and design platform for the PAN9420 Module. There are two optional methods to interact with the PAN9420 using the Evaluation Kit:

3.2.1 Wired

This method uses the provided USB ports with USB0 for commands and USB1 for data. Using this scheme, you will also need to use the Terminal program and the WIFIgurator. You will be able to:

- Interact with the various SW modules provided by the integrated stack
  - Issue commands
  - Receive acknowledgment (and Error codes)
- Stream data
- Upload new:
  - Web server content
  - Server and Client certificates
  - Client private keys
  - Configuration files

3.2.2 Wireless

This method is using the Wi-Fi connection and allows the user to access the web server, and interact with its content. You can still interact with the stack, given that the webserver provides a command interface to the stack.

Please note that the two methods are distinct, and complementary to each other, yet, they share some limited overlapped functionality.

3.3 Powering the Evaluation Kit

3.3.1 General

To power up the evaluation kit, please choose between the following two methods

1. **External Power**

   Use X2 and X3 to provide 5V power from an external source. An external source can be a battery or a Power Supply. This method allows users to perform some power measurements.

The power provided to the board must be 5V DC.

2. **USB connection**
   a. Connect the MB's USB0 Port to your Computer's USB-Port.
   b. Alternatively, a portable power-bank which provides 5V can be used to power up the Eval Kit.

Using USB0 to power up the Eval Kit is the recommended method.

On the PAN9420 Evaluation Kit:

- USB0 is connected to the PAN9420's UART0.
  UART0 is primarily utilized to send commands to, and receive acknowledgments between the PAN9420 and the Host.
- USB1 is connected to the PAN9420's UART1.
  UART1 is employed by the following SW Modules to stream data:
  - Netcat
  - Webcat
  - UDP
  - HTTP client
  - MQTT client
  - Firmware update
  - CMD to BIN UART tunneling

3.3.2 Proper Jumpers Setup

Prior to applying power to the evaluation kit, please make sure that all the jumpers on the Motherboard are set properly.

In the picture below (circled in Red) are all related jumpers.

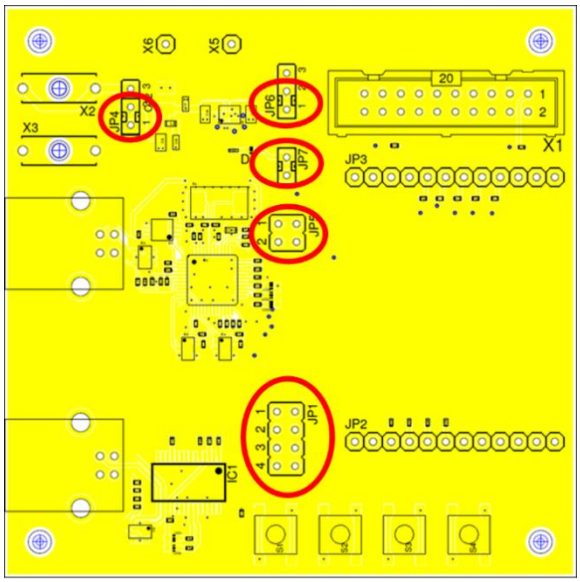
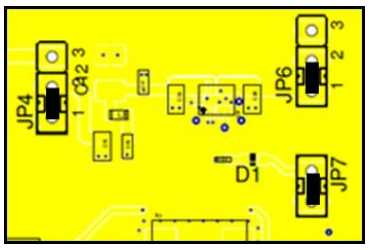


Figure 5: MB Jumpers Location

Please refer to Figure 5 above, as well to the pictures provided below.

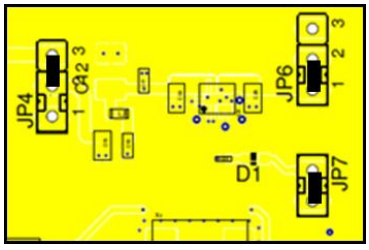
Powering the kit using USB0:

JP4	Pin 1 connected to Pin 2
JP6	Pin 1 connected to Pin 2
JP7	connected



Powering the kit using X2 and X3:

JP4	Pin 2 connected to Pin 3
JP6	Pin 1 connected to Pin 2
JP7	connected

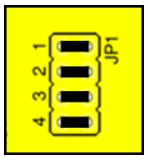


UART0 Jumpers:

JP5 1 connected across
2 connected across

UART1 Jumpers:

JP1 1 connected across
2 connected across
3 connected across
4 connected across



4 First Time Set Up

4.1 Powering

As mentioned above, to connect to and communicate with the Evaluation Kit and the PAN9420, you will need a PC with your choice of OS. Additionally, you will need the following tools to be installed on it:

- A browser
- A Terminal program to send and receive datagrams
- Alternatively, or additionally to the Terminal you will need the WIFIgurator

Please choose your preferred powering method as per ⇨ 3.3 Powering the Evaluation Kit above.

Once power is applied, the Eval Kit will power on and go through initialization. The boot and initialization takes a few seconds.

The subsequent LEDs on the ETU will light up as follows:

1. ***VCC*** Constantly on
2. ***READY*** Constantly on
3. ***MSTATUS*** Blinking

WSTATUS might be blinking periodically, which indicates the modules scanning process.

Please see below illustration of the LED position:

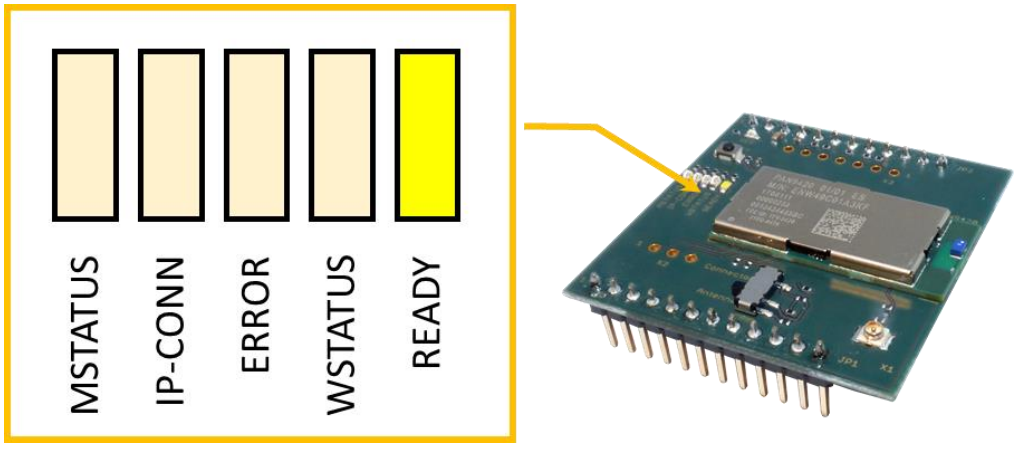


Figure 6: ETU LED position

4.2 Connecting the Evaluation Kit

As mentioned above in ⇨ 3.2 Interacting with the Evaluation Kit there are two optional methods to connect and interact with the PAN9420, please choose your preferred method, and use the following to interact with the PAN9420.

4.2.1 Wired – Connecting through USB0 and a Terminal Program

Simply connect the provided USB Type-B cable to USB0 of the MB and to a port in your computer.

> In the very first time connecting the USB0 of the MB to your PC, and given that the FTDI driver is NOT pre-installed on your machine, you will be asked to install the FTDI drivers.

After successfully installing the FTDI driver, your PC will enumerate two virtual COM ports. One is for JTAG-via-USB (mostly it is the lowest COM number of the two) and the other one is connected to PAN9420's UART0 (mostly it is the highest COM number of the two).

On a Windows machine, use the device manager to discern which COM number corresponds to UART0. After connecting the evaluation kit to your PC, in **device manager > ports**, you should see two COM ports (see below). Generally, the port with the highest number of the two corresponds with UART0. In the example below, you will use COM19.

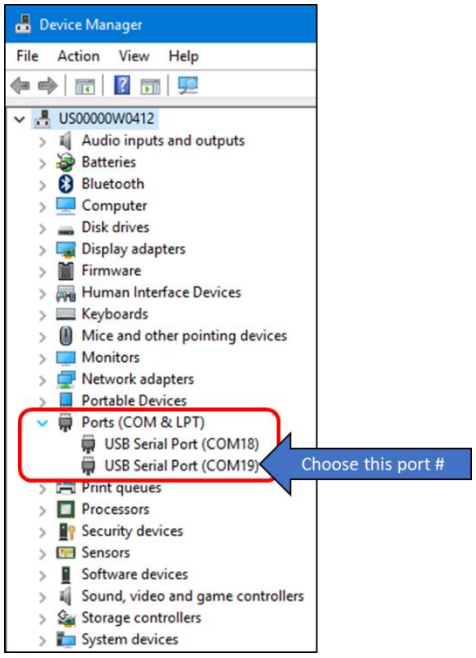


Figure 7: Device Manager and virtual COM ports

To test the Command Interface via USB0 you could use any terminal program, Panasonic's terminal program of choice is HTerm.

Default configuration for UART0 and UART1:

- Baud rate: 115200
- Data bits: 8
- Parity bit: none
- Stop bits: 1

UART0 does not utilize any flow control.

UART1 utilizes HW flow control (RTS/CTS). To achieve maximal throughput, flow control for UART1 is required.

If successfully connected, try to send the command `get system firmware` using your Terminal Program of choice, to request the firmware version of the module.

A command MUST BE followed by CR (Carriage Return) and LF (Line Feed) as described in the communication specification. You can set your terminal to issue them automatically.

You might also need to set the terminal's echo.

If you did not use HTerm before, please note:

If you are new to HTerm, please do not use the ASend button.
To invoke a command in Hterm –

- Type it in
- Press **[Enter]** on your keyboard

Figure 8: Invoking a command in HTerm

The response from the PAN9420 should be received like in the received window of the HTerm-based example below:

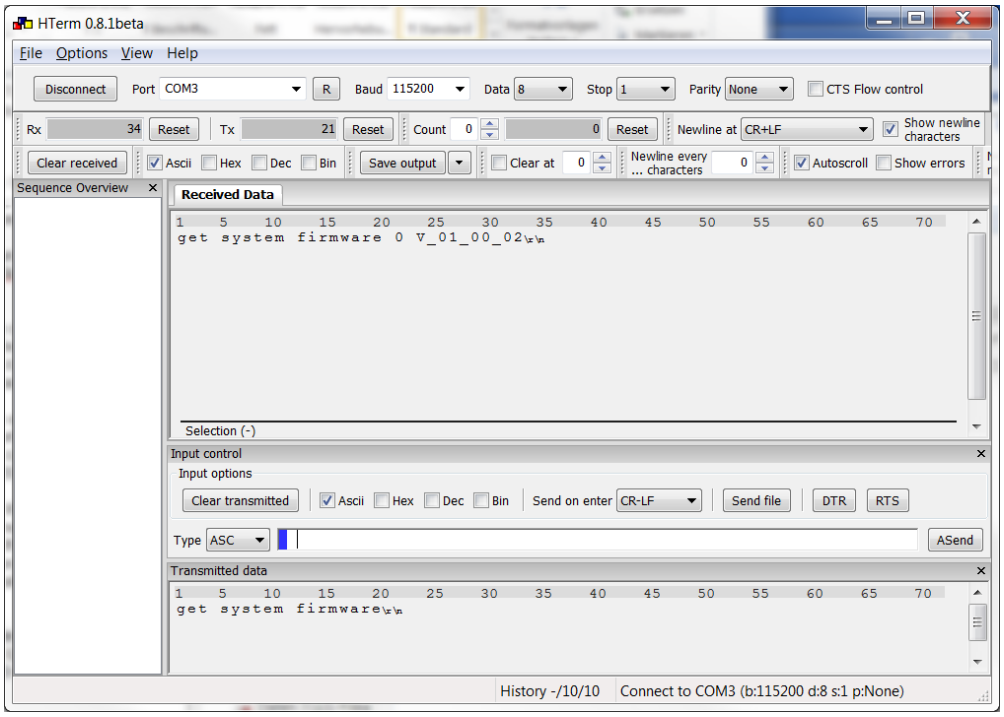


Figure 9: Terminal Set Up and Response

4.2.2 Wired – Connecting through USB0 and the WIFIgurator

An alternative to using a Terminal Program is using the WIFIgurator provided by Panasonic. The WIFIgurator incorporates Terminal like capabilities, along with an easy-to-use GUI.

As in ⇨ 4.2.1 Wired – Connecting through USB0 and a Terminal Program, connect the MB's USB0 to your PC's USB port using the provided USB Type-B cable.

From the WIFIgurator's directory (see ⇨ 2.2 Additional Equipment), double-click the executable `WIFIgurator.exe`.

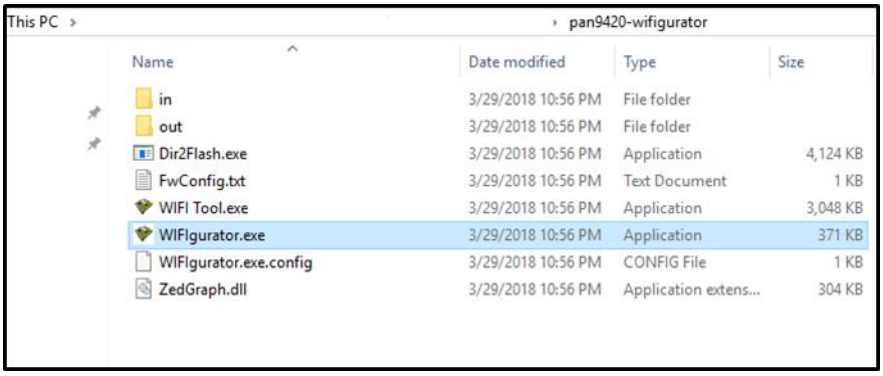


Figure 10: WIFIgurator Directory

You will see the WIFIgurator's GUI along with the Welcome Page.

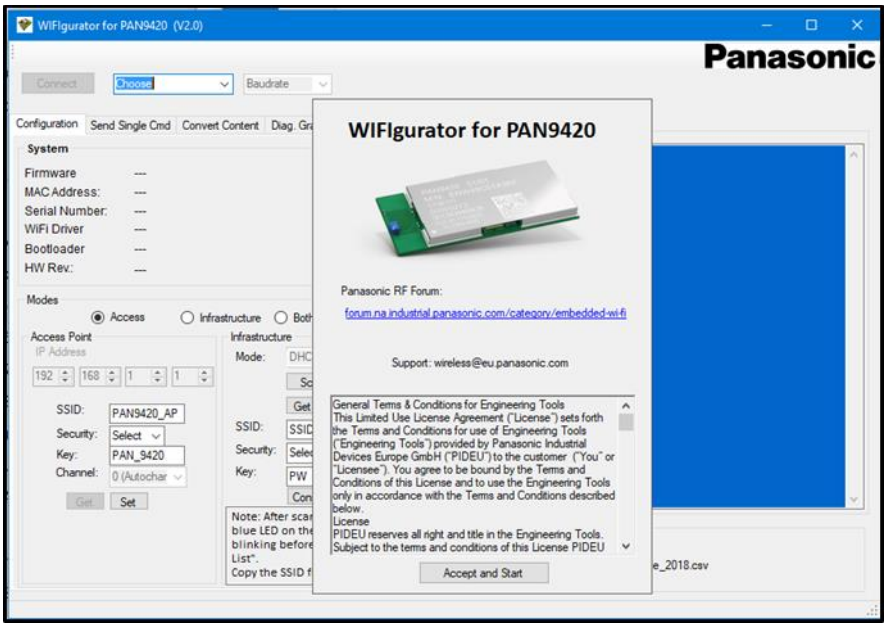


Figure 11: WIFIgurator Welcome

To start the program, read the general Terms and Conditions, then click on the **Accept and Start** button. In order to read out the modules firmware, MAC address, serial number, radio version, bootloader version and hardware revision, perform the following steps:

1. On the top, choose the corresponding COM port. It is the same as used in ⇨ 4.2.1 Wired – Connecting through USB0 and a Terminal Program.
2. Click the **Connect** button.

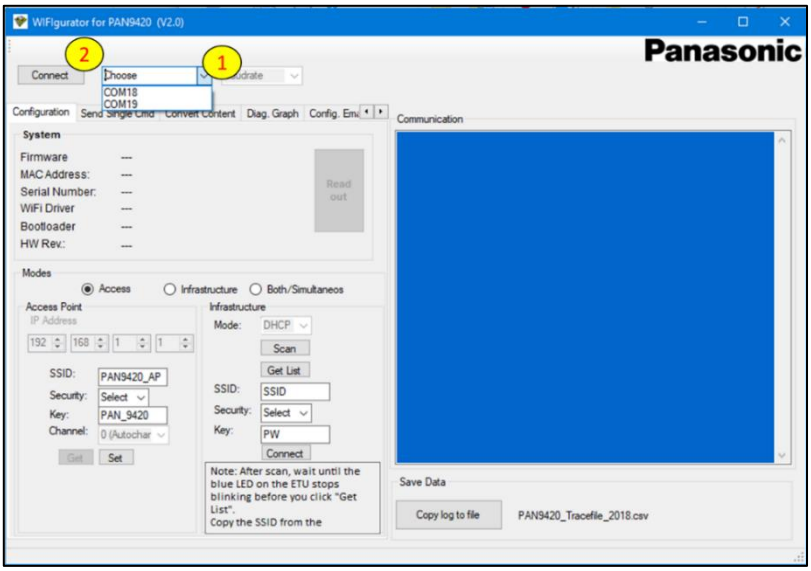


Figure 12: WIFIgurator connection

3. Lastly click on the **Read Out** button.
4. You should see a response in the **Communication** part of the GUI:

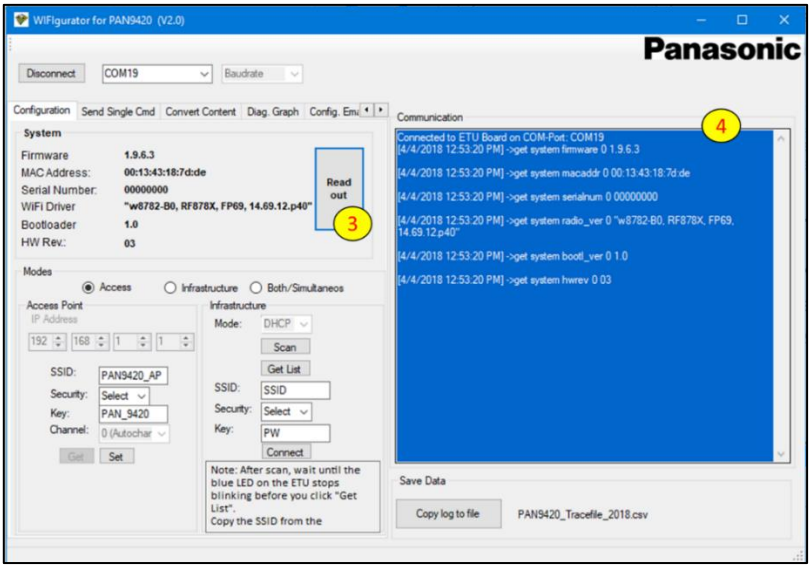


Figure 13: WIFIgurator Reading Info

Using the WIFIgurator you will be able to

- Issue commands and see the response
- Easily and using the GUI, set major key features
- Convert your HTML code to a firmware update file (.fwu)
- Load the firmware onto the module

4.2.3 Wireless – Connecting through Wi-Fi

To connect to the PAN9420 through Wi-Fi, all you need to do, is to apply power to the Evaluation Kit (see ⇨ 3.3 Powering the Evaluation Kit).

Once the board is powered and initialized, activate the **WLAN Network Manager** on your PC or Smart Device.

In Windows based machines, it is mostly on the bottom right corner of the screen.

Your device will scan for new wireless Access Points (APs):

- Look for the SSID **PAN9420_AP**.
- Connect to **PAN9420_AP**.
- The standard connection is protected with a WPA2 key. When prompted to enter a password, please enter the default password: `PAN_9420`.

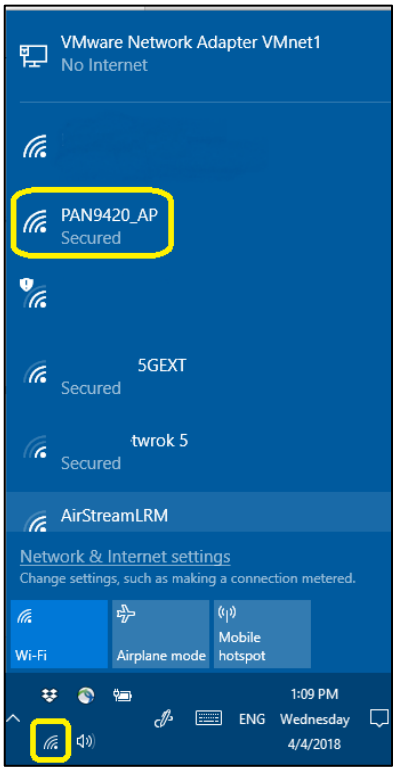


Figure 14: Wi-Fi connection

When the connection is established:

- Open any internet browser (i.e. Firefox, Chrome, etc.).
- Enter the default IP-Address of the PAN9420 in the URL line: `192.168.1.1`

  As the PAN9420 supports mDNS, you could alternatively use `pan9420.local` or `pan9420` in the URL line instead of the IP Address.

  Please note that some browsers support this feature, and some do not.
- The PAN9420's webserver will prompt you for authentication, depending on your browser, you will see a pop-up and you will be asked to type in a username and a password.

  When prompted please enter:

  Username: **admin**

  Password: **admin**

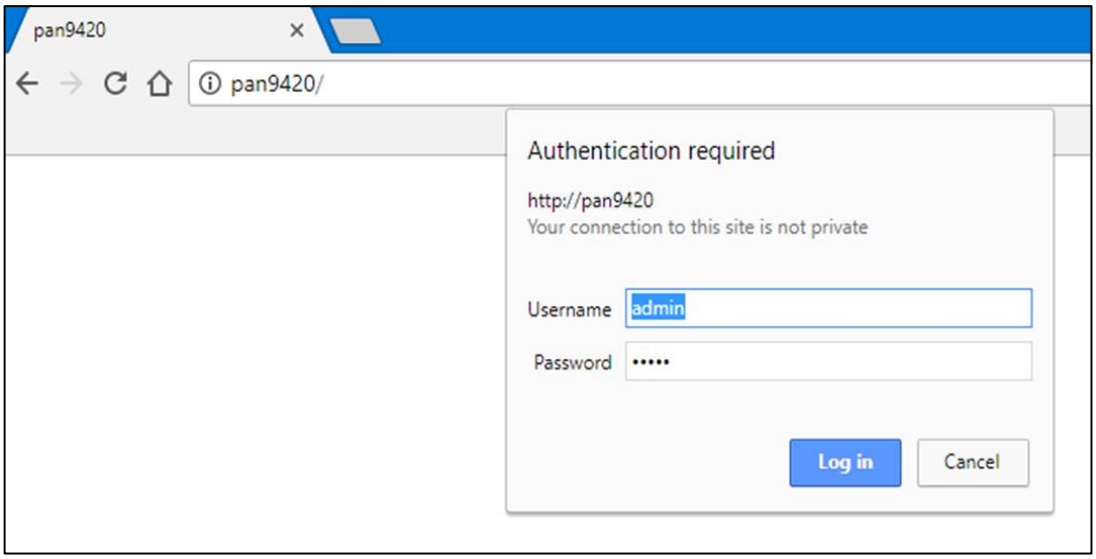


Figure 15: Web Server Authentication

5 Navigating the PAN9420 Web Server

While using Wi-Fi connectivity, and once authenticated and connected to the webserver, you are accessing and browsing the web server's HTML and related resources.

The webserver is a SW module, and it is provided as part of the PAN9420's stack. The PAN9420 modules that are provided with the ETU also include Panasonic's default web pages. However, standard PAN9420 modules are supplied with no additional code. The default web server content which is provided with the PAN9420 ETU allows the user to experience some of the capabilities of the web server. Among them:

- Configuring the AP and STA parameters.
- Scan for APs.
- Get some training via the provided tutorials.

You are encouraged to navigate through web pages, please see below for some of the optional web pages.

Users can utilize up to 2 MByte of the internal flash memory for the hosted web server content, custom configuration files, certificates and keys.

5.1 Web Server Default Home Page

After providing the web server's IP address, or by using the mDNS name, the very first page is the Welcome or Homepage (see below).

You have three tabs to choose from

- Home:

  Will bring you back to the Home page
- Web-App:

  Will allow you to choose from two options:
  - Tutorials
  - Web Desktop
- Info:

  Provide info about the provider of the content

Figure 16: PAN9420 Default Web Server Home Page

5.2 Web-App Page

The Web-App page allows you to choose between the on-module tutorials and the Web-Desktop. Again, all of which are hosted on the PAN9420.

By clicking on one of the icons, you will be taken to the corresponding landing page.

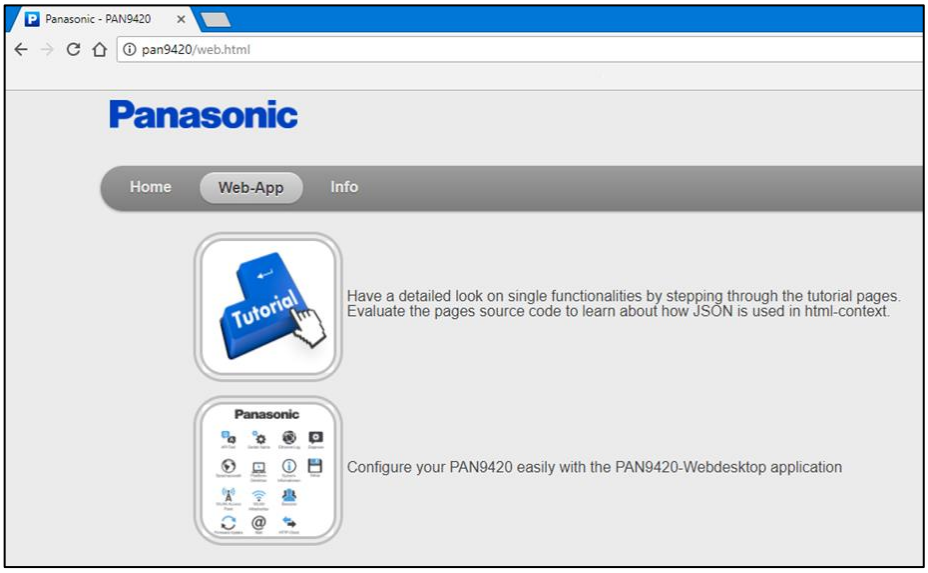


Figure 17: Web-App Page

5.2.1 Web-Desktop Page

The Web-Desktop is an example for a landing page that allows the designer to provide the end-user with an easy web based UI (User Interface). By combining HTML and JSON, information can be retrieved in real time, rendered and streamed to the user's browser.

A similar web desktop can be designed to manage and configure various features while streaming information.

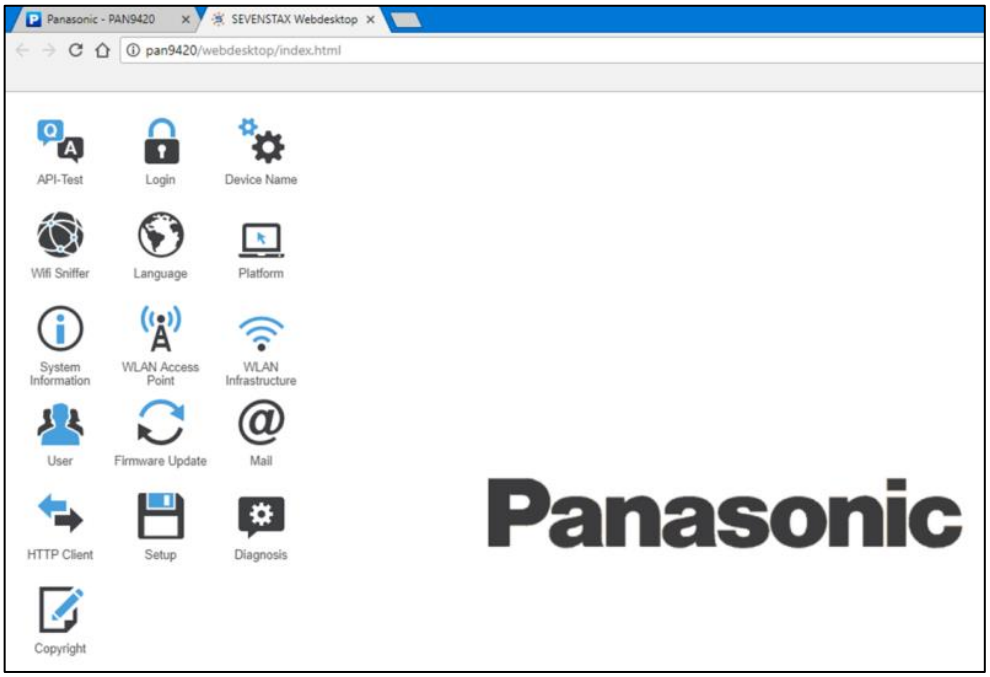


Figure 18: Web Desktop

5.2.2 Tutorial Page

The tutorial page provides a collection of simple to follow tutorials. Each designed to demonstrate a different feature or SW Modules of the stack. From interaction with other web servers, to controlling GPIOs.

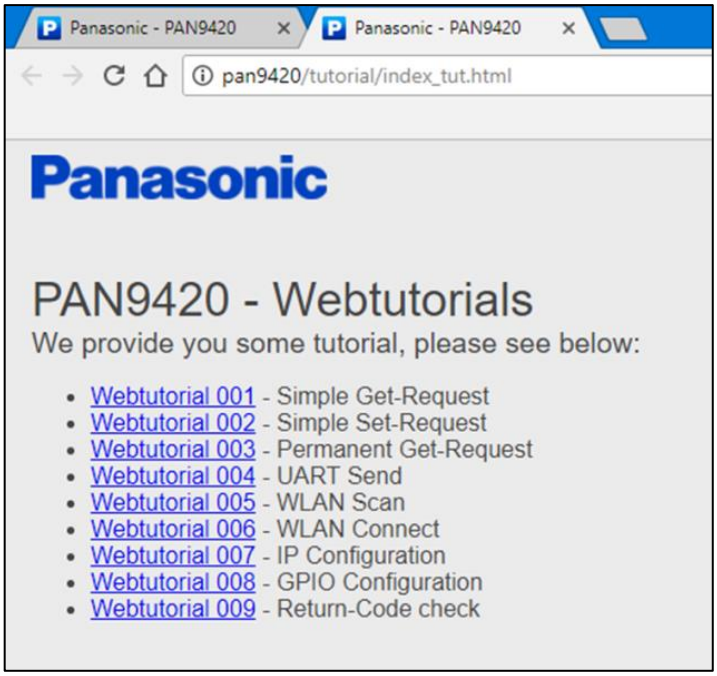


Figure: 19 Tutorials

For a more detailed information on how to create your own web content using JSON, you could access the development tutorials flashed on the module, as depicted above.

6 Further Information

6.1 Contact Us

Please contact your local Panasonic Sales office for details on additional product options and services:

For Panasonic Sales assistance in the **EU**, visit

https://eu.industrial.panasonic.com/about-us/contact-us

Email: wireless@eu.panasonic.com

For Panasonic Sales assistance in **North America**, visit the Panasonic Sales & Support Tool to find assistance near you at

https://na.industrial.panasonic.com/distributors

Email: wireless@us.panasonic.com

For questions and to look to share your experience, please visit the **Panasonic Wireless Technical Forum** to submit a question at

https://forum.na.industrial.panasonic.com

6.2 Product Information

Please refer to the Panasonic Wireless Connectivity website for further information on our products and related documents:

For complete Panasonic product details in the **EU**, visit

http://pideu.panasonic.de/products/wireless-modules.html

For complete Panasonic product details in **North America**, visit

http://www.panasonic.com/rfmodules