



QUICK START GUIDE

ARTiGO A820

Linux EVK v4.0.1

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Revision History

Version	Date	Remarks
1.00	08/31/2018	Initial release

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1. Introduction

This Quick Start Guide provides an overview of how to boot the Android EVK system image on the ARTiGO A820 system and configure the supported hardware function in the build.

The ARTiGO-A820 Linux EVK v4.0.1 is developed based on the NXP fsl-yocto-L4.1.15_1.1.0-ga (Yocto 2.0 Jethro) and enables the hardware features of the ARTiGO A820 system.

1.1 EVK Package Content

There are three folders in the package listed as below.

Firmware folder	Description
ARTiGOA820_Yocto2.0_BIN_v4.0.1.tar.gz	Yocto EVK system image and installation script files
Document folder	Description
ARTiGO-A820_Linux_BSP_v4.0.1_Quick_Start_Guide_v1.00_20180831.pdf	Quick Start Guide
Tools folder	Description
BT_Config.zip	Bluetooth A2DP configuring file

ARTiGO-A820 Linux EVK contents

1.1.1 Firmware Folder Contents

ARTiGOA820_Yocto2.0_BIN_v4.0.1.tar.gz: contains installation script files and the precompiled U-boot and image for evaluating the ARTiGO 820 system.

1.1.2 Document Folder Contents

ARTiGO-A820_Linux_BSP_v4.0.1_Quick_Start_Guide_v1.00_20180831.pdf: This Quick Start Guide provides an overview of how to boot the Android EVK system image on the ARTiGO A820 system and configure the supported hardware function in the build.

1.1.3 Tools Folder Contents

BT_Config.zip: contains the Bluetooth A2DP configuring file.

1.2 Version Information and Supported Features

- U-Boot version: 2015.04
- Kernel version: 4.1.15
- Evaluation image: OpenEmbedded-core built with Yocto 2.0 Jethro
- Development based on NXP fsl-yocto-L4.1.15_1.1.0-ga (Yocto 2.0 Jethro)
- Supports SPI with eMMC or Micro SD boot (default)
- Supports HDMI display
- Supports HDMI audio output
- Supports COM1 (RS-232/RS-485), Onboard COM as debug port
- Supports Gigabit Ethernet (LAN 1)
- Supports 10/100Mbps Ethernet (LAN 2)
- Supports VNT9271 USB Wi-Fi dongle
- Supports EMIO-1541 miniPCle Wi-Fi module
- Supports EMIO-2531 miniPCle Wi-Fi & BT module
 - Supports Bluetooth A2DP and SPP profile
- Supports EMIO-2550 miniPCle Mobile Broadband module
- Supports Watchdog Timer, GPIO and RTC

2. Image Installation

This section explains the setup requirements for booting from a Micro SD card or the SPI ROM and eMMC.

The installation script files, the precompiled U-boot and image are provided in the “Firmware” folder.

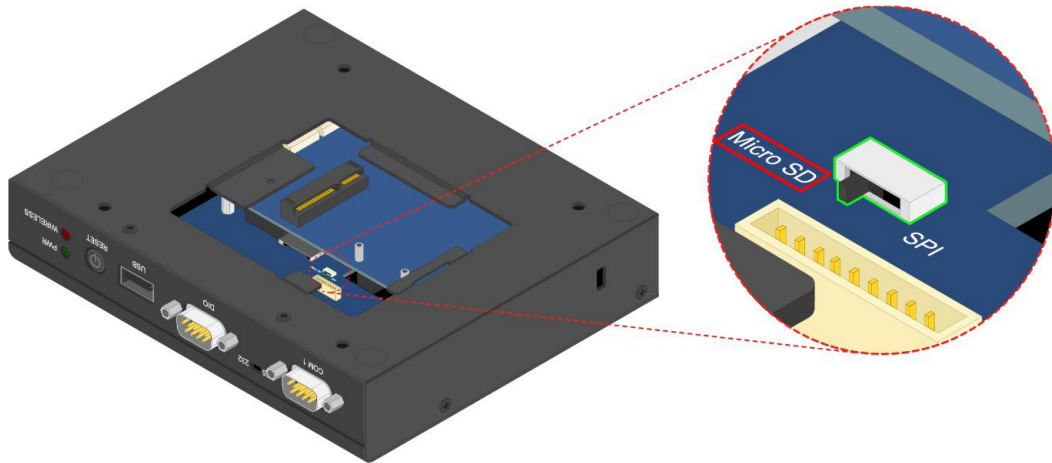
2.1 Booting from a Micro SD Card

The first step is to install this image onto a Micro SD card. Insert a Micro SD card into your Linux host machine and make sure it is not mounted. Install the SD card image onto the Micro SD card with the commands below, replacing <device name> with the correct value for the card.

***Important:** Make sure you are writing to the correct device or the host system environment could be damaged.

```
$ tar xvf ARTiGOA820_Yocto2.0_BIN_v4.0.1.tar.gz
$ cd sd_installer/
$ sudo ./mk_sd_installer.sh /dev/<device name> --yocto
```

Next, on the ARTiGO-A820, set the boot switch to the Micro SD position as shown below.



Micro SD / SPI boot switch diagram

Insert the prepared Micro SD card into the ARTiGO A820, connect an HDMI display, and power on the ARTiGO A820 to initiate the boot process.

When the boot process is completed, you will see the OpenEmbedded desktop.

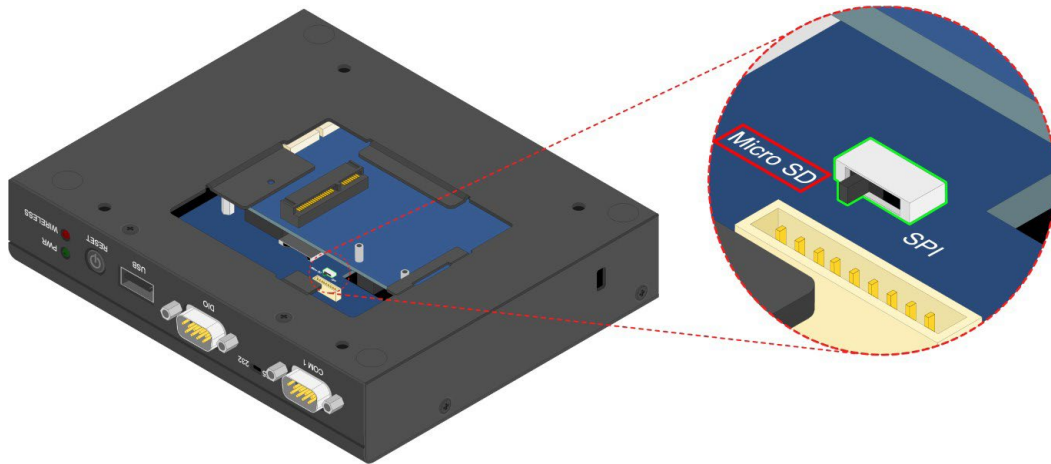
2.2 Booting from the SPI ROM with eMMC

The ARTiGO A820 supports booting from the SPI ROM while loading the kernel and root filesystem from eMMC.

The first step is to prepare a Micro SD card as the system installer. Insert a Micro SD card into your Linux host machine and make sure it is not mounted. Install the system installer onto the Micro SD card with the command below, replacing <device name> with the correct value for the card.

```
$ tar xvf ARTiGOA820_Yocto2.0_BIN_v4.0.1.tar.gz
$ cd sd_installer/
$ sudo ./mk_sd_installer.sh /dev/<device name>
```

Next, on the ARTiGO A820, set the boot switch to the Micro SD position as shown below.

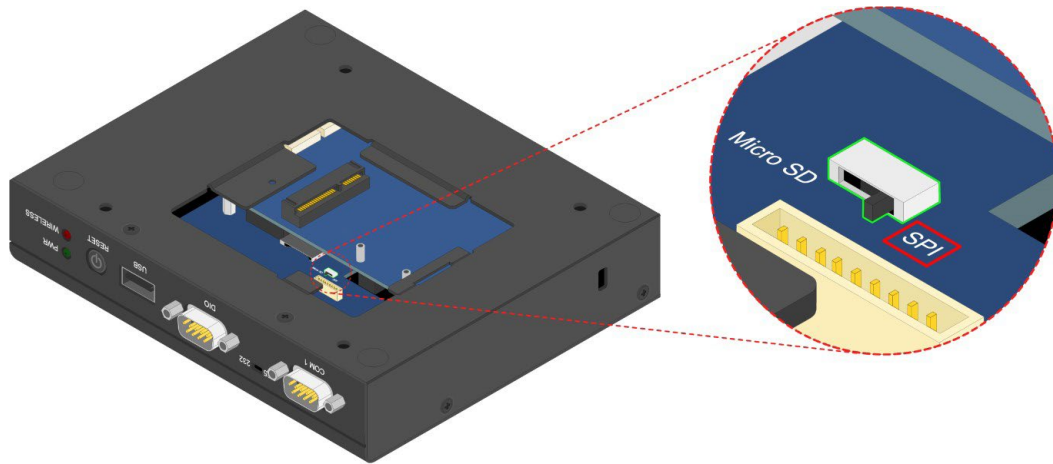


Micro SD / SPI boot switch diagram

Insert the prepared Micro SD card into the ARTiGO A820, and power on the ARTiGO A820. The system will automatically start to install U-boot and the image into SPI ROM and eMMC.

When the install process is completed, unplug the power cable and remove the Micro SD card.

Next, in order to boot from the SPI ROM make sure the boot switch is set to SPI ROM boot.



Micro SD / SPI boot switch diagram

Next, connect an HDMI display, and power on the device to initiate the boot process. When the boot process is completed, you will see the OpenEmbedded desktop.

3. Hardware Function

This section explains how to enable and test the hardware functions precompiled in the ARTiGO A820 Linux EVK including setting U-Boot parameters, configuring Watchdog Timer, setting up GPIO, and configuring RTC.

3.1 Setting Up U-Boot Parameters

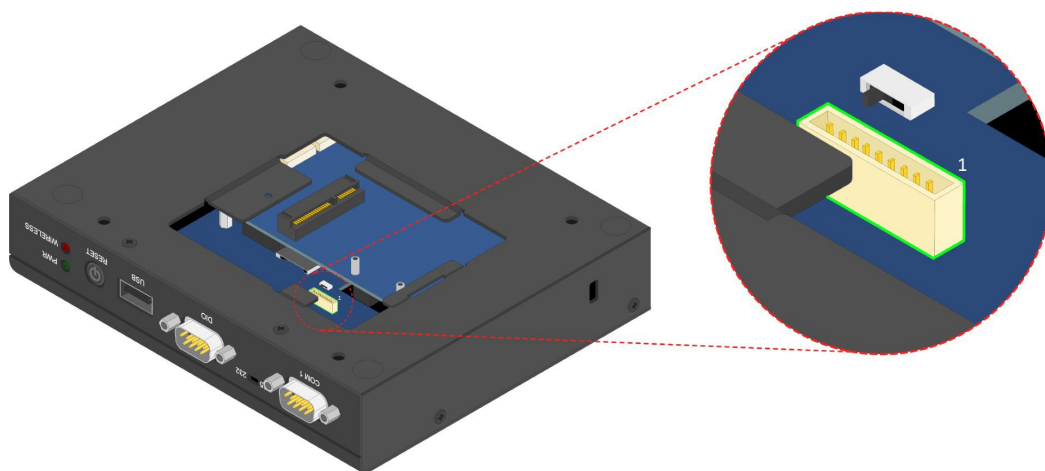
When setting up the U-Boot parameters, the first step is to connect the host machine and the ARTiGO A820 through the Onboard COM port. Use a serial port communication program such as PuTTY, GtTerm, or Minicom to configure the serial port setting and connect to the debug console. There you will be able to see the U-Boot boot log and adjust settings in the U-Boot console.

```

+-----+
| A  -   Serial Device       : /dev/ttyMXC0 |
| B  -   Lockfile Location   : /var/lock   |
| C  -   Callin Program      :              |
| D  -   Callout Program     :              |
| E  -   Bps/Par/Bits        : 115200 8N1  |
| F  -   Hardware Flow Control : No        |
| G  -   Software Flow Control : No        |
+-----+

```

Serial port setting of host machine



Onboard COM port diagram

Next, power on the ARTiGO A820 to initiate the boot process. When prompted, press any key to stop the boot process and enter the U-Boot console as illustrated by the screenshot below.

```
U-Boot 2015.04-imx_v2015.04_4.1.15_1.0.0_ga+gd7d7c43 (Feb
20 2017 - 14:19:23)

CPU:   Freescale i.MX6Q rev1.5 at 996 MHz
CPU:   Temperature 30 C
Reset cause: POR
Board: MX6DL-VAB820
I2C:   ready
DRAM:  1 GiB
MMC:   FSL_SDHC: 0, FSL_SDHC: 1
SF: Detected W25Q32BV with page size 256 Bytes, erase size
4 KiB, total 4 MiB

No panel detected: default to Hannstar-XGA
Display: Hannstar-XGA (1024x768)
In:     serial
Out:    serial
Err:    serial
Net:    FEC [PRIME]
Warning: failed to set MAC address

Normal Boot
Hit any key to stop autoboot:  0
=>
```

Debug console view of boot process

To list the current U-Boot parameters, use the following command:

```
=> printenv
```

To have more information make sure the printout message includes “bootcmd=run bootcmd_auto”.

The default “bootcmd” parameter is set to auto detect the system location by first attempting to load the kernel from the Micro SD card. If it is not detected it continues to boot from the eMMC.

To load the kernel from the specified device, refer to the two examples below.

To load the kernel from the Micro SD card, use the following command:

```
=> setenv bootcmd 'run bootcmd_sd'
=> saveenv
=> boot
```

To load the kernel from the eMMC, use the following command:

```
=> setenv bootcmd 'run bootcmd_mmc'
=> saveenv
=> boot
```

3.2 Restoring Default U-Boot Parameters

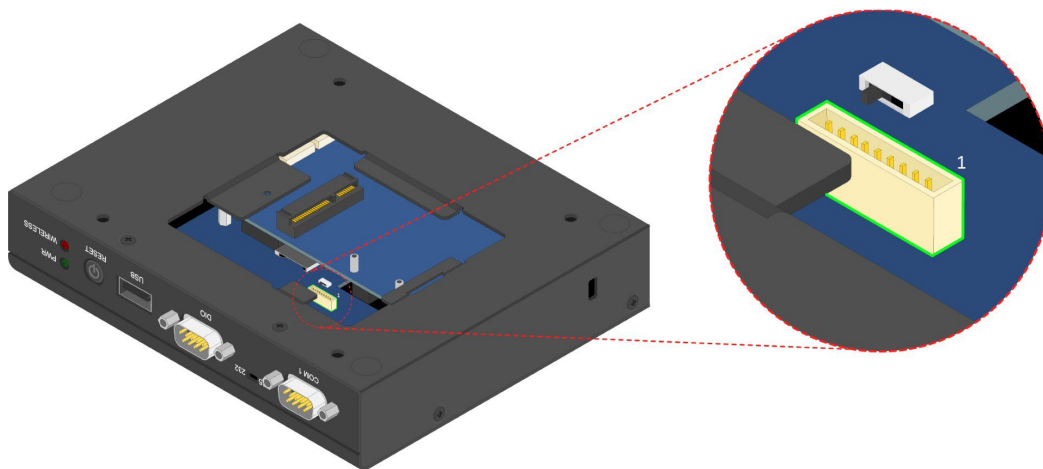
If the U-Boot parameters have been modified, the “destroyenv” command in the U-Boot console can restore the factory defaults settings.

To restart the device, use the “reset” command:

```
=> destroyenv
=> reset
```

3.3 Using the OpenEmbedded Console

The first step is to connect the host machine and the ARTiGO A820 through the COM 2 port. Use a serial port communication program such as PuTTY, GtTerm, or Minicom to connect to the debug console. There you will be able to see the U-Boot boot log and adjust settings in the U-Boot console. Next, power on the ARTiGO-A820 to initiate the boot process. When the boot process is completed you will be prompted to login.



On board COM port diagram

The default account is “root”, with no password set (just press Enter when prompted for password).

```
...
Freescale i.MX Release Distro 4.1.15_1.1.1 imx6qvab820 /dev/ttyMX1
imx6qvab820 login: root
```

3.4 Configuring Watchdog Timer

A Watchdog timer is an electronic timer that is used to detect and recover from system malfunctions.

The **wdt_driver_test.out** provides an application to configure the Watchdog timer.

To enable the Watchdog with the default timeout (60 seconds), use the following command:

```
$ /unit_tests/wdt_driver_test.out enable wdt
```

To change the timeout <value> and the system reboot <value> (seconds), use the following command:

```
$ /unit_tests/wdt_driver_test.out set_timeout <value>
```

To send keep-alive requests to the Watchdog <value> (seconds), use the following command:

```
$ /unit_tests/ wdt_driver_test.out set_keep_alive <value>
```

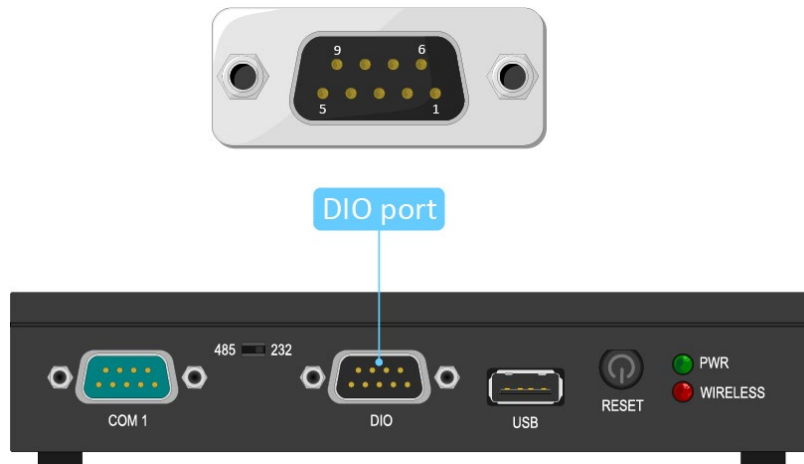
When the value of “set_keep_alive” is smaller than the value of “set_timeout”, the system will not reboot.

To disable the Watchdog, use the following command:

```
$ /unit_tests/wdt_driver_test.out disable wdt
```

3.5 Setting Up GPIO

The DIO port on the ARTiGO A820 consists of 9 pins. The following section explains setting up these pins for input/output communication



DIO port diagram

Pin	Signal	Pin	Signal
1	RESET_N	2	P_LED+
3	GND	4	P_LED-
5	I2C3_SCL	6	W_LED+
7	I2C3_SDA	8	W_LED-
9	5VIN	10	GND
11	GPIO_1	12	GPIO_7
13	GPIO_2	14	GPIO_8
15	GPIO_4	16	GPIO_9
17	GPIO_5	18	GPIO_16
19	GND	20	

J7 pin header pinout table

3.5.1 Setting Up DIO Port for GPIO Functionality

The echo value of GPIO pins are listed below:

Pin	Signal	GPIO echo value
1	GPIO_7	7
2	GPIO_1	1
3	GPIO_8	8
4	GPIO_2	2
5	GPIO_9	9
6	GPIO_4	4
7	GPIO_16	203
8	GPIO_5	5
9	GND	

GPIO port pinout table

Set the multifunction pin as a GPIO pin. Here is the example for GPIO pin 1:

```
$ echo 7 > /sys/class/gpio/export
```

3.5.2 Setting Up GPI Mode

To set a pin to “input” mode (GPI), use the following command (here is the example for GPIO pin 1):

```
$ echo "in" > /sys/class/gpio/gpio7/direction
```

To read the GPI input value, use the following command:

```
$ cat /sys/class/gpio/gpio203/value
```

3.5.3 Setting Up GPO Mode

To set a pin to “output” mode (GPO), use the following command (here is the example for GPIO pin 1):

```
$ echo "out" > /sys/class/gpio/gpio7/direction
```

To output a “Low” value on the GPO pin, use the following command:

```
$ echo 0 > /sys/class/gpio/gpio7/value
```

To output a “High” value on the GPO pin, use the following command:

```
$ echo 1 > /sys/class/gpio/gpio7/value
```

3.6 Configuring RTC

The RTC (Real-Time Clock) keeps track of the current time values. The time values include the year, month, date, hours, minutes and seconds. To configure the RTC on the ARTiGO A820, set the system time with the Linux date command as in the example shown below:

```
$ date mmddHHMMYYYY
```

Time	Value
mm	2-digit month
dd	2-digit day
HH	2-digit hours in 24h system
MM	2-digit minutes
YYYY	4-digit year

Time value table

For example, the value 061110072013 means June 11 2013 10:07. The date command also accepts other time formats. For more information, use the following command:

```
$ date --help
```

To write the system time to the RTC, use the following command:

```
$ hwclock -w -f /dev/rtc0
```

To read the RTC time, use the following command:

```
$ hwclock -r
```


4. Accessories

This section explains how to install and configure the various USB dongle and miniPCle modules available for the ARTiGO A820 system.

4.1 Configuring the VNT9271 USB Wi-Fi Dongle

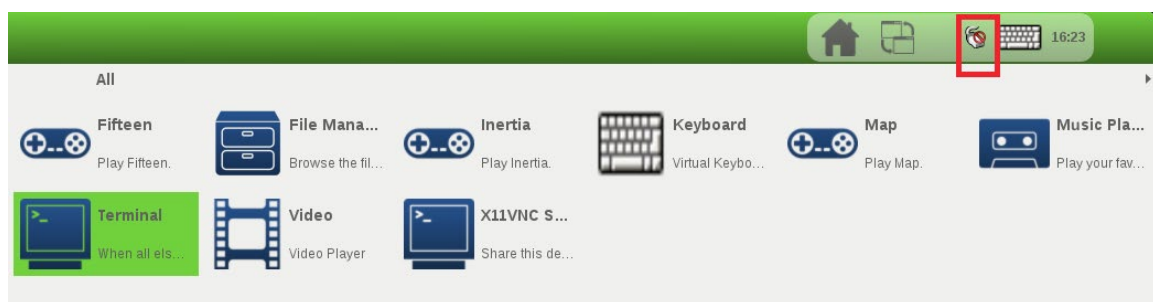
The VNT9271 USB Wi-Fi dongle supports Wi-Fi functionality through USB port connection.

The first step is to insert the VNT9271 USB Wi-Fi dongle into a USB port. Next, make sure to unplug any LAN cables or other Wi-Fi/3G modules you have installed. Finally, power on the ARTiGO A820.



Inserting the VNT9271 USB Wi-Fi dongle

When the boot process is completed, click on the “Connection Manager” icon to configure WLAN.



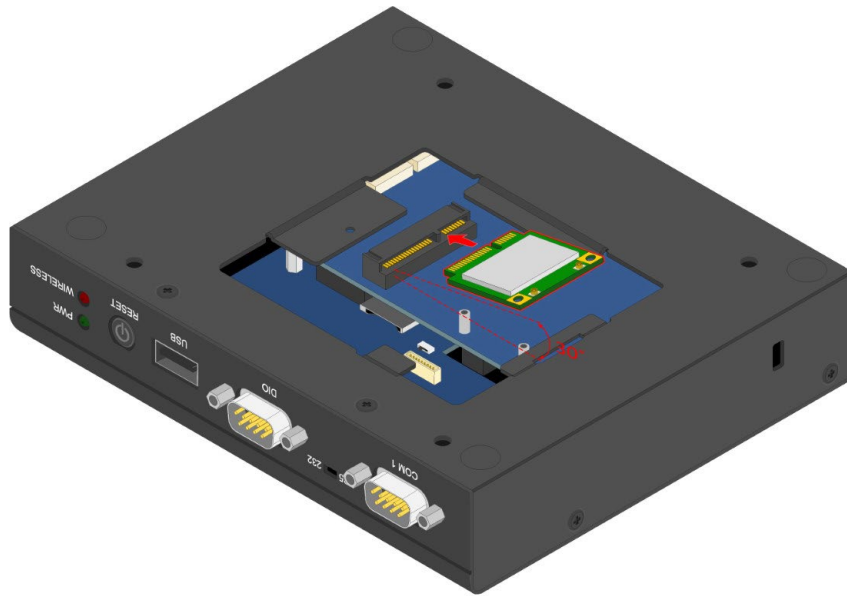
Connection Manager icon diagram

When the connection is created, connect to the internet through your web browser.

4.2 Configuring the EMIO-1541 miniPCle Wi-Fi Module

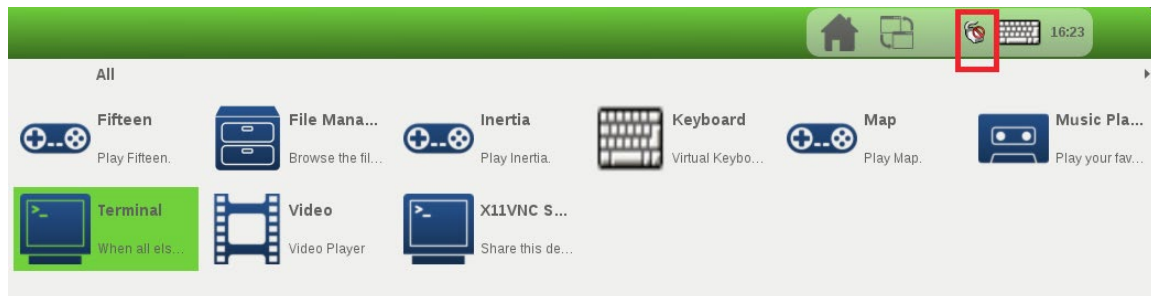
The EMIO-1541 module supports Wi-Fi through the onboard miniPCle slot.

The first step is to insert the EMIO-1541 module into the miniPCle slot. After installing the module, connect the provided antenna to the module. Next, make sure to unplug any LAN cables or USB Wi-Fi dongles you have installed. Finally, power on the ARTiGO A820.



Inserting the EMIO-1541 module

When the boot process is completed, click on the “**Connection Manager**” icon to configure WLAN.



Connection Manager icon diagram

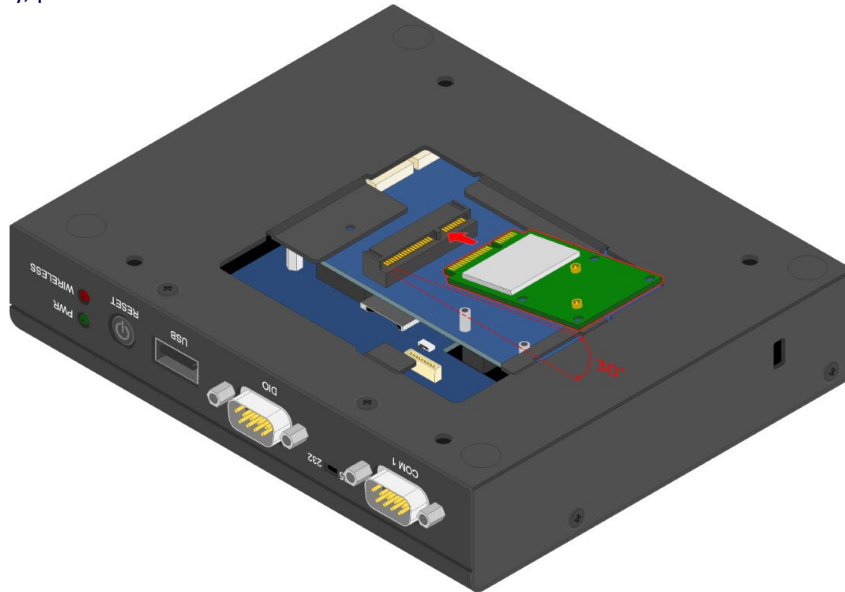
When the connection is created, connect to the internet through your web browser.

4.3 Configuring the EMIO-2531 miniPCle USB Wi-Fi & Bluetooth Module

The EMIO-2531 module supports USB Wi-Fi and Bluetooth functionality through miniPCle connections.

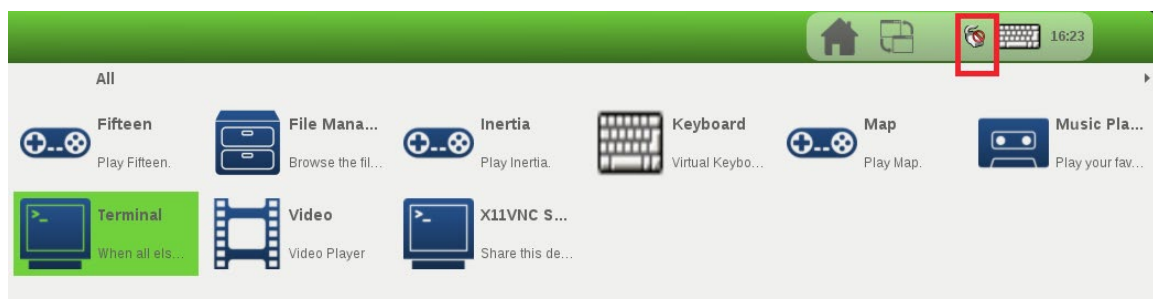
4.3.1 Connecting to the Internet

The first step is to insert the EMIO-2531 module into the miniPCle slot. After installing either module connect the provided antenna to the module. Next, make sure to unplug any LAN cables or other Wi-Fi/3G modules you have installed. Finally, power on the ARTiGO A820.



Inserting the EMIO-2531 module

When the boot process is completed, click on the “**Connection Manager**” icon to configure WLAN.



Connection Manager icon diagram

When the connection is created, connect to the internet through your web browser.

4.3.2 Enabling Bluetooth

The following section explains setting up the Advanced Audio Distribution Profile (A2DP) and Serial Port Profile (SPP).

4.3.2.1 Setting Up Bluetooth A2DP Profile

To add A2DP support to the ARTiGO A820, first copy and replace the **pulseaudio-system.conf**, **bluetooth.conf** to the **/etc/dbus-1/system.d** folder. Next, copy and replace the system.pa files to the **/etc/pulse/folder**. These files are located in the EVK/BT_Config folder of the BSP.

To enable the Bluetooth service, use the following command:

```
$ rfkill unblock bluetooth
$ hciconfig hci0 up
$ hciconfig hci0 piscan
$ /usr/lib/bluez5/bluetooth/bluetoothd -C -d &
```

Use the following commands to run the “bluetoothctl” to show the Bluetooth MAC address and set up pairing mode for the EMIO-2531 module.

```
$ bluetoothctl
[NEW] Controller 5C:F3:70:24:4B:2E
[bluetooth]#
[bluetooth]# show
Controller 5C:F3:70:24:4B:2E
    Name: BlueZ 5.25
    Alias: BlueZ 5.25
    ...
[bluetooth]# select 5C:F3:70:24:4B:2E
[bluetooth]# power on
Changing power on succeeded
[bluetooth]# agent on
Agent registered
[bluetooth]# default-agent
Default agent request successful
[bluetooth]# discoverable on
Changing discoverable on succeeded
[CHG] Controller 5C:F3:70:24:4B:2E Discoverable: yes
[bluetooth]# pairable on
Changing pairable on succeeded
[bluetooth]# scan on
Discovery started
[CHG] Controller 5C:F3:70:24:4B:2E Discovering: yes
[NEW] Device 00:1D:82:BC:C1:C4 Jabra BT-530
...
[bluetooth]# scan off
[bluetooth]# devices
Device 00:1D:82:BC:C1:C4 Jabra BT-530
Device ...
[bluetooth]# pair 00:1D:82:BC:C1:C4
[bluetooth]# trust 00:1D:82:BC:C1:C4
```

To enable Bluetooth device, use the following commands:

```
[bluetooth]# connect 00:1D:82:BC:C1:C4
[bluetooth]# info 00:1D:82:BC:C1:C4
[bluetooth]# quit
```

The default audio output setting for the ARTiGO A820 is HDMI device.

To list all the available audio output devices, use the following command:

```
$ pactl list short sinks
0 alsa_output.platform-sound-hdmi.23.analog-stereo module-alsa-card.c s16le 2ch 48000Hz
SUSPENDED
1 alsa_output.platform-sound.22.analog-stereo module-alsa-card.c s16le 2ch 48000Hz
SUSPENDED
2 bluez_sink.00_1D_82_BC_C1_C4 module-bluez5-device.c s16le 2ch 48000Hz IDLE
```

From the output, we can see the following:

- 0 = HDMI device
- 1 = Line-out
- 2 = Bluetooth device

To set up the audio output to a Bluetooth device, use the following command:

```
$ pacmd set-default-sink 2
```

***Note:** If you would like to change audio output after enabling a Bluetooth device, use the commands below:

To set up the audio output to Line-out, use the following command:

```
$ pacmd set-default-sink 1
```

To set up the audio output to HDMI device, use the following command:

```
$ pacmd set-default-sink 0
```

4.3.2.2 Setting Up Bluetooth SPP Profile

The ARTiGO A820 supports SPP server mode and SPP client mode.

To enable the Bluetooth service, use the following command:

```
$ rfkill unblock bluetooth
$ hciconfig hci0 up
$ hciconfig hci0 piscan
$ /usr/lib/bluez5/bluetooth/bluetoothd -C -d &
```

Use the following commands to run the “bluetoothctl” to show the Bluetooth MAC address and set up pairing mode for the **EMIO-2531** module.

```
$ bluetoothctl
[NEW] Controller 5C:F3:70:24:4B:2E
[bluetooth]# scan on
Discovery started
[CHG] Controller 5C:F3:70:24:4B:2E Discovering: yes
[NEW] Device 5C:F3:70:25:DD:33 BlueZ 5.25
...
[bluetooth]# scan off
[bluetooth]# devices
Device 5C:F3:70:25:DD:33 BlueZ 5.25
Device ...
[bluetooth]# pair 5C:F3:70:25:DD:33
[bluetooth]# trust 5C:F3:70:25:DD:33
[bluetooth]# quit
```

SPP server mode:

If you do not change the listen channel number, the service will automatically use the default channel number. Make sure the server or client mode is using the same bluetooth channel number.

To set up the SPP server mode and allow other devices to connect, use the following commands:

```
$ sdptool add SP
Serial Port service registered
$ rfcomm listen hci0
Waiting for connection on channel 1
Connection from 5C:F3:70:25:DD:33 to /dev/rfcomm0
Press CTRL-C for hangup
```

SPP client mode:

If you do not change the listen channel number, the service will automatically use the default channel number. Make sure the server or client mode is using the same listen channel number.

Use the following commands to set up the SPP client mode and request a connection to SPP server.

```
$ sdptool add SP
Serial Port service registered
$ rfcomm connect hci0 5C:F3:70:24:4B:2E
Connected /dev/rfcomm0 to 5C:F3:70:24:4B:2E on channel 1
Press CTRL-C for hangup
```

To open the minicom serial communication program, use the following command:

```
# minicom -s
```

Connect to the **/dev/rfcomm0** serial device with the following settings:

```
+-----+
| A -   Serial Device       : /dev/rfcomm0 |
| B -   Lockfile Location   : /var/lock   |
| C -   Callin Program      :             |
| D -   Callout Program     :             |
| E -   Bps/Par/Bits        : 115200 8N1  |
| F -   Hardware Flow Control : No        |
| G -   Software Flow Control : No        |
+-----+
```

Serial port setting of EMIO-2531 module

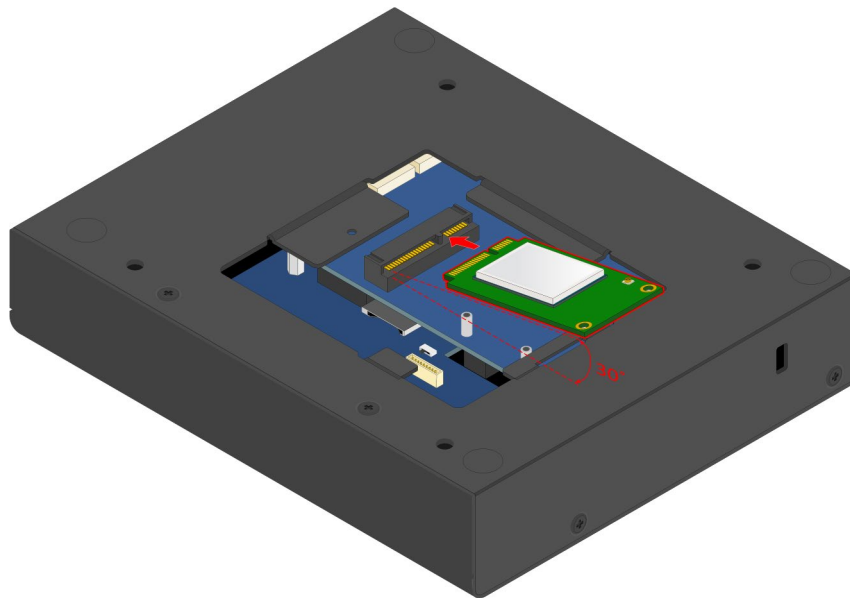
Start a serial communication program on the host machine with the same communication settings using the appropriate Bluetooth SPP device. Afterwards the Bluetooth SPP device and the ARTiGO A820 will be able to communicate through the programs (for example sending a keypress on one machine should be shown on the other machine).

4.4 Configuring the EMIO-2550 miniPCle Mobile Broadband Module

The EMIO-2550 miniPCle Mobile Broadband module supports 3G and GPS functions.

4.4.1 Connecting to the Internet

The first step is to insert an active SIM card into the EMIO-2550 module, and then insert the EMIO-2550 module into the miniPCle slot. After installing the module connect the provided antenna to the module. Next, make sure to unplug any LAN cables or USB Wi-Fi dongles you have installed. Finally, power on the ARTiGO A820.



Inserting the EMIO-2550 module

To check that the system has correctly detected the EMIO-2550 module, use the following command:

```
$ lsusb
```

Make sure the printout message includes “Bus 001 Device 004: ID 1545:1102 U-Blox AG”.

Configure the 3G function by creating a PPP connection with root privilege.

```
$ pppd call Module-ZU200
```

Once the PPP connection has been created, connect to the internet through your web browser.

4.4.2 Enabling GPS

To configure the GPS function of the module requires the use of the Minicom serial communication program. Open the Minicom serial communication program with the following command:

```
$ minicom -s
```

Connect to the **/dev/ttyUSB1** serial device with the following settings:

```
+-----+
| A -   Serial Device           : /dev/ttyUSB1 |
| B -   Lockfile Location       : /var/lock   |
| C -   Callin Program          :             |
| D -   Callout Program         :             |
| E -   Bps/Par/Bits            : 115200 8N1  |
| F -   Hardware Flow Control   : No         |
| G -   Software Flow Control   : No         |
+-----+
```

Serial port setting of EMIO-2550

When the setup is complete, type the following GPS AT commands into Minicom: AT+UGPRF=1, AT+UGRMC=1, AT+UGGSV=1, AT+UGZDA=1, and AT+UGPS=1,0

Wait for the “OK” message before sending the next AT command.

```
AT+UGPRF=1
OK
AT+UGRMC=1
OK
AT+UGGSV=1
OK
AT+UGZDA=1
OK
AT+UGPS=1,0
OK
```

Use the Minicom to set the serial device **/dev/ttyUSB7** in another terminal and it will output the data received from the GPS module as illustrated in the screenshot below.

```
$GPRMC,142015.00,A,2501.93961,N,12133.66111,E,0.068,,030314,,,A*73
$GPGSV,4,1,13,01,34,184,29,03,49,023,47,06,26,042,41,07,44,317,26*75
$GPGSV,4,2,13,08,13,323,,11,60,192,,13,29,242,38,16,33,071,16*79
$GPGSV,4,3,13,19,65,356,44,23,18,208,12,27,35,034,27,30,37,145,29*7B
$GPGSV,4,4,13,32,01,154,*4B
$GPZDA,142015.00,03,03,2014,00,00*62
```

GPS NMEA message



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