

JouKo control device software- Installation guide

This guide file can be downloaded from the public repository of **JouKo project**,
“Flexible Power Usage at Home”: <https://github.com/Teukka/FlexHomeElPower>

General information

Needed during installation process:

- a computer with an SD card input device or port
- Raspberry PI (tested with Raspberry Pi 1 A +)
- at least 8 GB SD-card (tested with 16-gigabytes SD card)

The following notation is used for commands to be entered.

```
sudo apt update
```

Some commands must be accepted by typing ‘y’ + enter.

About software

The control device software is designed to work with both Python 2 (2.7.13) and Python 3 (3.6.2) versions. This has been done to ensure easy updating of the software in the future.

The most commonly updated variables, such as communication parameters, are placed in distinctly named json files to facilitate changes.

About JouKo control device

The Jouko control device software and operating system are mainly stored on the SD card. On the devices with Lora radio: Laird RM186 has smartBasic software to communicate via LoRa radio and control the Lora radio's integrity. The devices with BT radio: Laird RM186 smartBasic Bluetooth communication software can be installed on the RM186.

The control device measures current via relays, power supply voltage and regulator voltage via the SPI bus that located on the GPIO interface of the Raspberry Unix computer. Via the GPIO interface, the software also controls the operation of the relays. The control unit also manages power breaks in an internal SQL database and monitors the integrity of the device's operation in different ways. The control device communicates with the radio by using AT commands via GPIO's UART bus. The radio chip can be RM186 and/or the SIM800F depending on the device version. The controller uses MultiDeviceLoader to update smartBasic software of the RM186.

The SmartBasic LoRa and Bluetooth Central software is designed to be compatible with firmware version 100.6.1.0 of the RM186. The Bluetooth Peripheral program is similarly compiled for compatibility with peripheral firmware version 18.17.1.0.

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Install the operating system

1. Install the Raspbian operating system

Download the NOOBS file at <https://www.raspberrypi.org/downloads/noobs/>

- The file name is in the format "NOOBS_vX_X_X.zip (10.8.2018 version 'NOOBS_v2_8_2')

Follow the installation instructions at <https://www.raspberrypi.org/learning/software-guide/> and unzip the contents of the zip-file on the SD memory card.

Quick guide for Raspbian installation:

- use SD-formatter to format SD card if needed
- unzip "NOOBS_vX_X_X.zip" to the empty SD card
- Power up Raspberry from the SD card and select to install Raspbian.
- choose language settings (eg: Suomi, suomi, Helsinki)

Set the password as empty.

Log on to the WLAN and wait for Raspberry to update automatically.

2. Update the Raspbian operating system and libraries

(If the upgrade succeeded in the previous section, this step will not affect the system.)

Run Command Line Commands:

```
sudo apt update  
sudo apt upgrade
```

If necessary, restart and run the update commands repeatedly until no more components are updated.

JOUKO-software

3. Download JouKo-software from the github

Run the git clone command:

```
git clone https://github.com/Teukka/Jouko
```

Required programs and libraries

4. Programs and common libraries

Run the first batch to install necessary libraries and applications.

```
cd Jouko  
./install1.bat
```

Define IO and buses

5. Raspberry IO – Define SPI bus

Run the installer batch command:

```
./install2.bat
```

The Setup program opens the menu to configure Raspberry settings to set the device's SPI bus. See help: <https://learn.adafruit.com/adafruits-raspberry-pi-lesson-4-gpio-setup/configuring-spi>

To configure the Raspberry SPI bus, select the following options:

5 Interfacing Options → 4 SPI → Enable

Exit settings and accept the changes. The installer then restarts the device.

6. Raspberry IO – Define UART bus

Run the installation program that defines the UART bus.

Run command:

```
cd Jouko  
./install3.bat
```

After the UART bus has been define, "config.txt" file appears in the text editor. Copy the following two lines to the end of the file:

```
enable_uart=1  
dtoverlay=pi3-disable-bt
```

To make changes, press "CTRL + O" and "enter". To exit the program, press "CTRL + X".

Raspberry reboots.

7. Define AD converter, libraries and clock settings

Runs an installer that defines the AD converter and updates the device.

Run command:

```
cd Jouko  
./install4.bat
```

Raspberry reboots.

Define the settings

8. Set the Jouko software auto-start

Set the automatic program startup as follows:

<https://www.dexterindustries.com/howto/run-a-program-on-your-raspberry-pi-at-startup/>

Set main_loop.py to start automatically.

```
sudo nano /etc/rc.local
```

Add the following as the last row before the "exit 0" line:

```
python /home/pi/jouko/main_loop.py &
```

9. Define the device settings in .json files

For all device types:

- Define a unique device ID for your device in the .json file under 'laite-ID' ('Device ID')
- Define the device type in the kommunikaatio.json ('communication') file, setting the correct value to 'true'

A. If the GPRS version:

- Specify the operator-specific settings for the kommunikaatio.json (eg APN)

B. If LoRa version:

- Place the communication keys with the terminal using the AT commands (see separate guide document)

C. If a BT Master device:

- Define the address and pairing information of the slave devices into the kommunikaatio.json file

D. If the BT slave device:

- Define slave address and pairing information into .json files

If LoRa or BT: Install Laird software tools

10. If LoRa or BT: Provide sufficient resources for the user

Allow the user to access the sufficient resources (USB) - run the following commands: (see guide [https://github.com/LairdCP/UwTerminalX/wiki/Granting-non-root-USB-device-access-\(Linux\)](https://github.com/LairdCP/UwTerminalX/wiki/Granting-non-root-USB-device-access-(Linux)))

```
sudo su
```

go to the udev rules directory of the system:

```
cd /etc/udev/rules.d
```

Create a new file to which the rule is added:

```
nano 40-ftdi.rules
```

Copy the following text to the file:

```
#FTDI permissions granted to users group
SUBSYSTEM=="usb", ATTR{idProduct}=="6001", ATTR{idVendor}=="0403", MODE="0660",
GROUP="users"
SUBSYSTEM=="usb", ATTRS{idProduct}=="6001", ATTRS{idVendor}=="0403", MODE="0660",
GROUP="users"
SUBSYSTEMS=="usb-serial", MODE="0660", GROUP="users"
```

Update the rules:

```
udevadm control --reload
```

11. If LoRa or BT: Installing UwTerminalX to update SmartBasic

see guide: <https://github.com/LairdCP/UwTerminalX/wiki/Installing>

Download the installation package and unpack the installation package. The Raspbian operating system has been created on the basis of a 32-bit Debian version. Therefore, the UwTerminal should work without installing additional libraries.

Run the following commands:

```
cd
cd Jouko
mkdir UW
cd UW

wget
https://github.com/LairdCP/UwTerminalX/releases/download/v1.10a/UwTerminalX\_v1.10a\_RPi\_SSL.tar.gz

tar xf UwTerminalX_v1.10a_RPi_SSL.tar.gz

./UwTerminalX ACCEPT COM=ttyAMA0 BAUD=115200 STOP=1 DATA=8 PAR=0
```

Using UwTerminalX graphical user interface

Run on the command line:

```
./UwTerminalX ACCEPT
```

UWterminalX opens

Select device **RM186 / RM191** and click **"Accept"**.

12. If LoRa or BT: Install the Jouko software into the RM186

Install the Jouko software into the RM186's flash memory with the UwTerminal. Downloading smartBasic software is done by dragging the file on the UwTerminal program window.

If the RM186 flash is empty and correct firmware version is correct, you can use ready-made batch files to download the smartBasic. These batch file commands use multiDeviceLoader.

To download Lora Software to RM186 run the following command:

```
./lataa_Lora_SB.bat
```

To download Bluetooth Central Software to RM186 run the following command:

```
./lataa_BT_CE_SB.bat
```

To download Bluetooth Peripheral Software to RM186 run the following command:

```
./lataa_BT_PE_SB.bat
```

13. If BT: Set communication settings

Use 'UW-terminal' program to connect the RM186 module via a UART.

Ask the **BT address** of the device with the AT command:

```
ati 4
```

Answer is: "10 4 01 123412341234", where the device BT address is "01123412341234"

14. If Lora: Set the communication settings

Use 'UW-terminal' program to connect the RM186 module via a UART.

Ask the **DevEUI** with AT command:

```
ati 25
```

Answer is: "10 25 1234123412341234", where the DevEUI is: "1234123412341234"

Set the **AppEUI** communication key with AT command:

```
at+cfgex 1010 "1234567890123456"
```

Write down the key to a safe location, as the security key can not queried from the device.

Set the **AppKey** (Application Key) communication key with AT command:

at+cfgex 1012 "12345678901234567890123456789012"

when "12345678901234567890123456789012" is the AppKey.

Write down the key to a safe location, as the security key can not queried from the device.

All the security keys and **"at+cfgex"** style commands for setting up:

- at+cfgex 1010 "1234567890123456" (AppEui)
- NOTE! DO NOT USE 1011 COMMAND TO SET THE ADDRESS. USE THE PRE-DEFINED VALUE.
 - o (at+cfgex 1011 "1234567890123456" (DevEui is pre-defined in device.)
- at+cfgex 1012 "12345678901234567890123456789012" (Application Key)
- at+cfgex 1013 "12345678901234567890123456789012" (NwkSession key)
- at+cfgex 1014 "12345678901234567890123456789012" (AppSKey)
- at+cfgex 1015 "12345678" (Dev Address)

15. If Lora device: Set the communication keys on server

Create a functioning gateway, for example, through ThinkPark service. Place the same communication keys the server that were previously placed on the Lora device.

16. If Lora or BT: Update the RM186 firmware if necessary

The RM186 firmware should be updated before installing it on the circuit board.

If need to upgrade your firmware after physical installation:

Connect a custom UART adapter to the RM186 circuit terminals: RX, TX, and ground.

Do the firmware update according to Laird's guide "Upgrading RM1xx / RM1xx_PE Firmware":

<https://assets.lairdtech.com/home/brandworld/files/Upgrading%20Firmware%20via%20UART%20-%20RM1xx%20Series.pdf>