

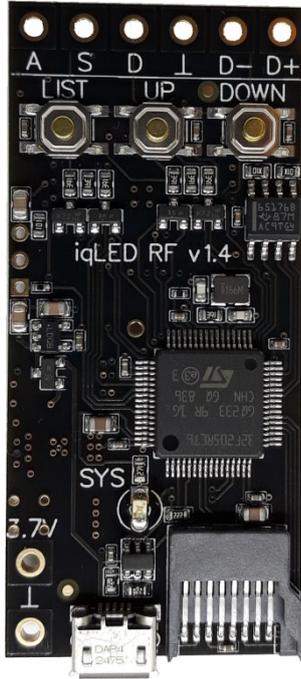
SD radio controller iqLED RF 1.2 and iqLED RF 1.4

User's manual

May 21, 2019

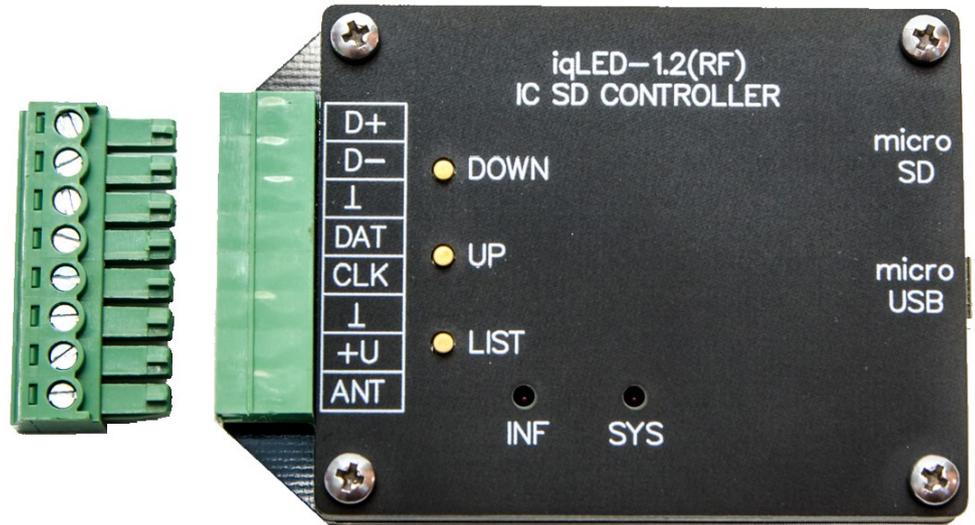
iqLED RF 1.x SD controller for managing smart LED pixels and Flash modules with DMX protocol support and radio synchronization between devices.

iqLED RF 1.4 Black



integrated module

iqLED RF 1.2



controller in the case

Two versions of the device:

iqLED RF 1.4 Black - easy integrated module.

iqLED RF 1.2 - controller version in the case.

Chip support: WS2801, WS2803, WS2811, WS2812(B), WS2813, WS2815, WS2818, UCS1903, APA102, SK9822, PL9823, DMX512.



Scope:

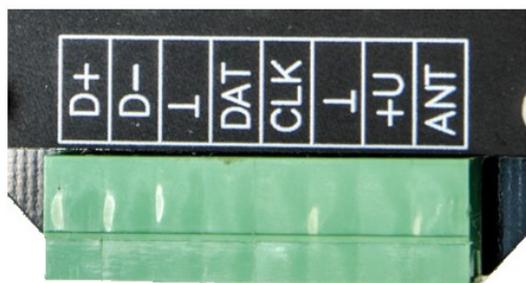
Smart LEDs • SMART pixel strips / arrays • DMX decoders / spotlights • SMART LED clusters • LED suits •

Technical specifications

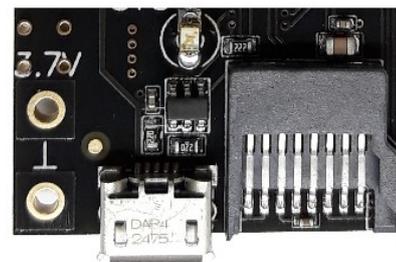
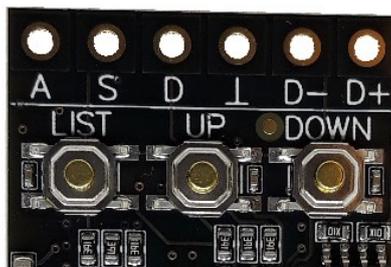
Parameter	iqLED RF 1.2	iqLED RF 1.4
number of programs (*.led)	up to 128	
number of conducted pixels	up to 2048	
number of radio frequency channels	8	
radio frequency band, MHz	433.075... 433.800	
supply voltage, V DC	+2,8....+6,3	
radio communication range, meters	150..400	
USB powered	yes	
current consumption, A	0,25	
operating temperature range, °C	-25...+55	-40...+85
dimensions, mm	80 x 50 x 18	61 x 27 x 8
data carrier type	microSD 2-32 GB	
file system	FAT32, exFAT	
built-in card reader	yes	
PC connection	yes	
group work	yes	
number of buttons	3	
number of IC ports	1 (*doubled)	
number of DMX ports	1	
firmware upgrade	supported	
max FPS for 2048 pixels	30	
weight, gr.	67.2	8.7

Destination of the controller terminals

iqLED RF 1.2



iqLED RF 1.4



destination	iqLED RF v1.2 terminal	iqLED RF v1.4 terminal
DMX+	D+	D+
DMX-	D-	D-
general	⊥	⊥
data output (DATA OUT 1)	DAT	D
*synchronization output (DATA OUT 2)	CLK	S
general	⊥	⊥
supply	+U	3.7V
antenna	ANT	A

* DATA OUT 2 terminal can be used as an additional data output for one line LED driver.

IqLED RF 1.x controller power supply

It is carried out from an external power source with a wide voltage range: from + 2.8V to + 6.3V, or through a USB port. Current consumption is not more than 0.25A. If a DMX line is connected to the controller, powering the device from USB is not allowed.

A power supply unit, as well as batteries can be used as a power source.

power supply unit



iqLED RF 1.4



iqLED RF 1.4



power supply

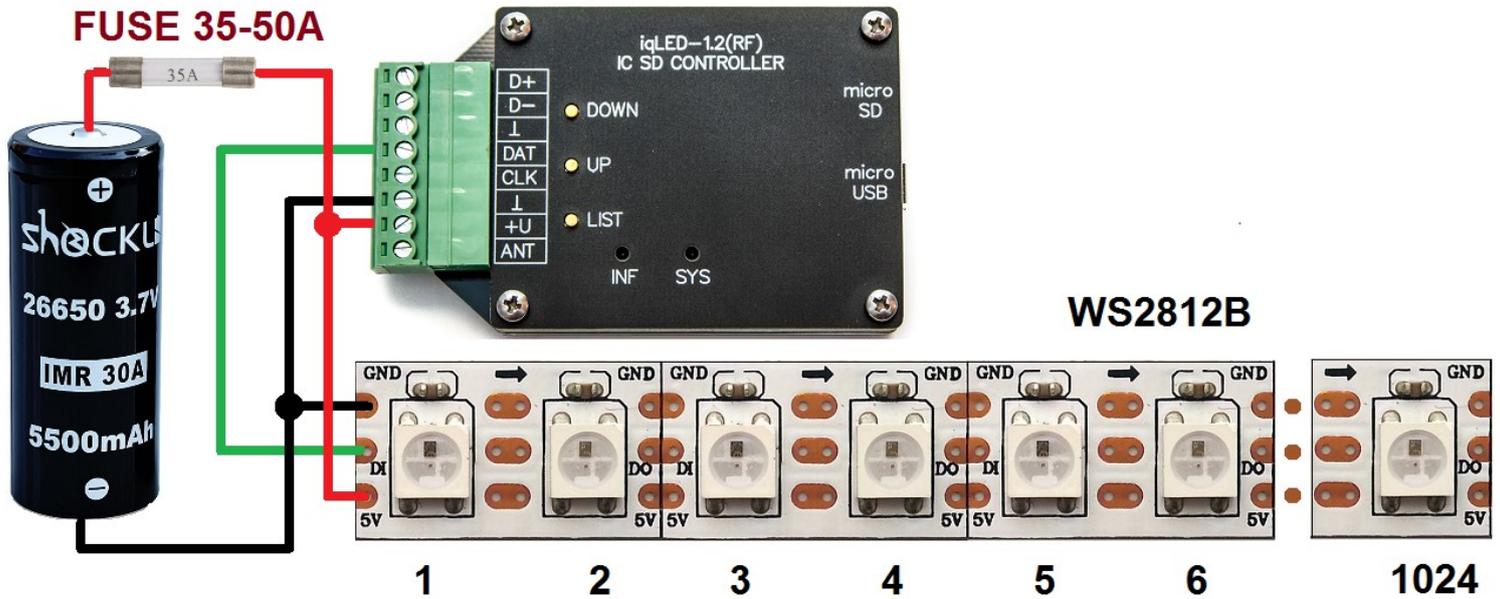


iqLED RF 1.2

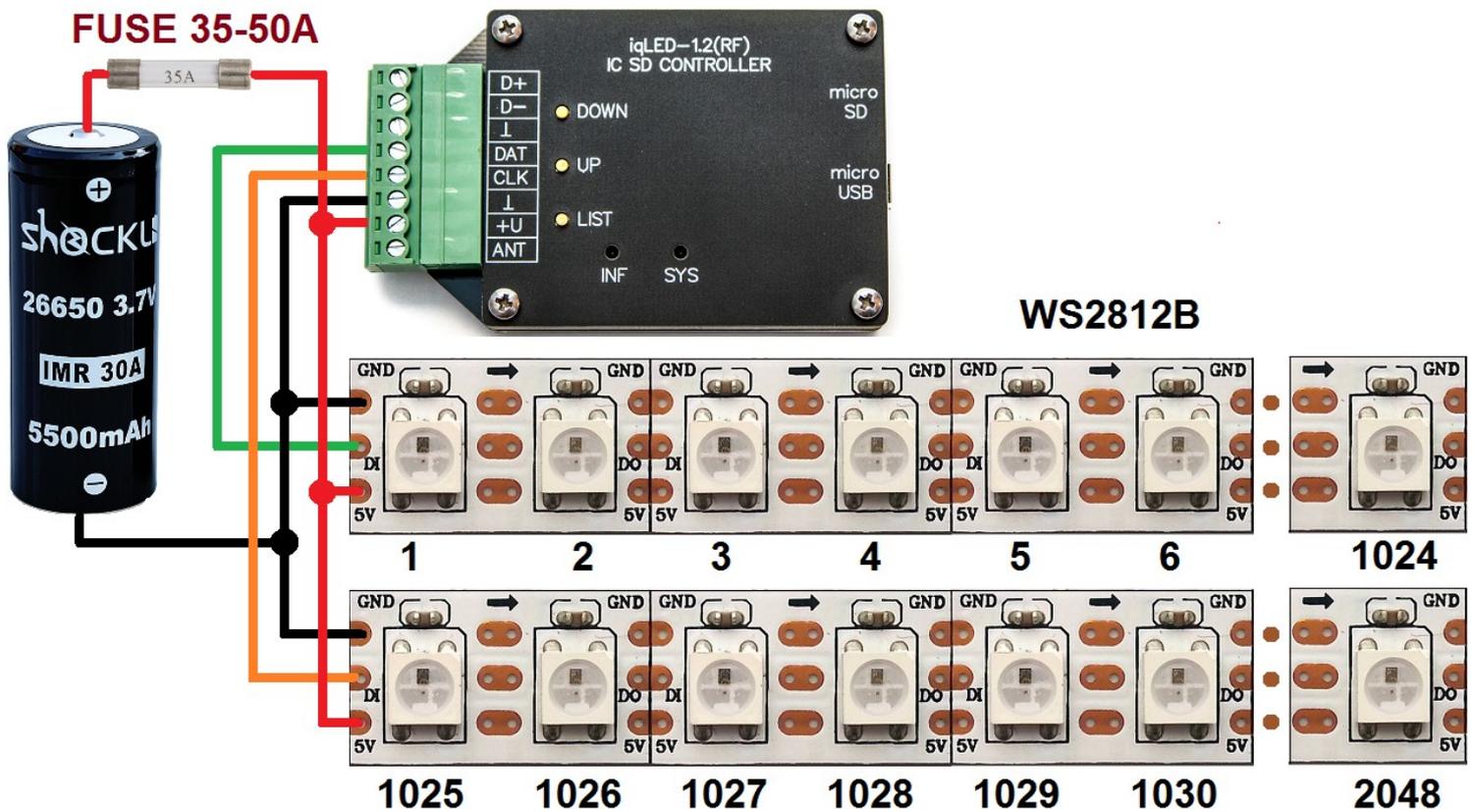


The choice of power source must be made on the basis of the required supply voltage of the LED pixels and the total current load. For example, to supply power to the LED strip WS2813, consisting of 1200 pixels, you will need a 5V, 72A (400 Watt) or 2 Li-ion 26650 3.7V network power supply with 50A output current.

An example of connecting a LED tape WS2812B using Li-ion 25650 3.7V 30A batteries.

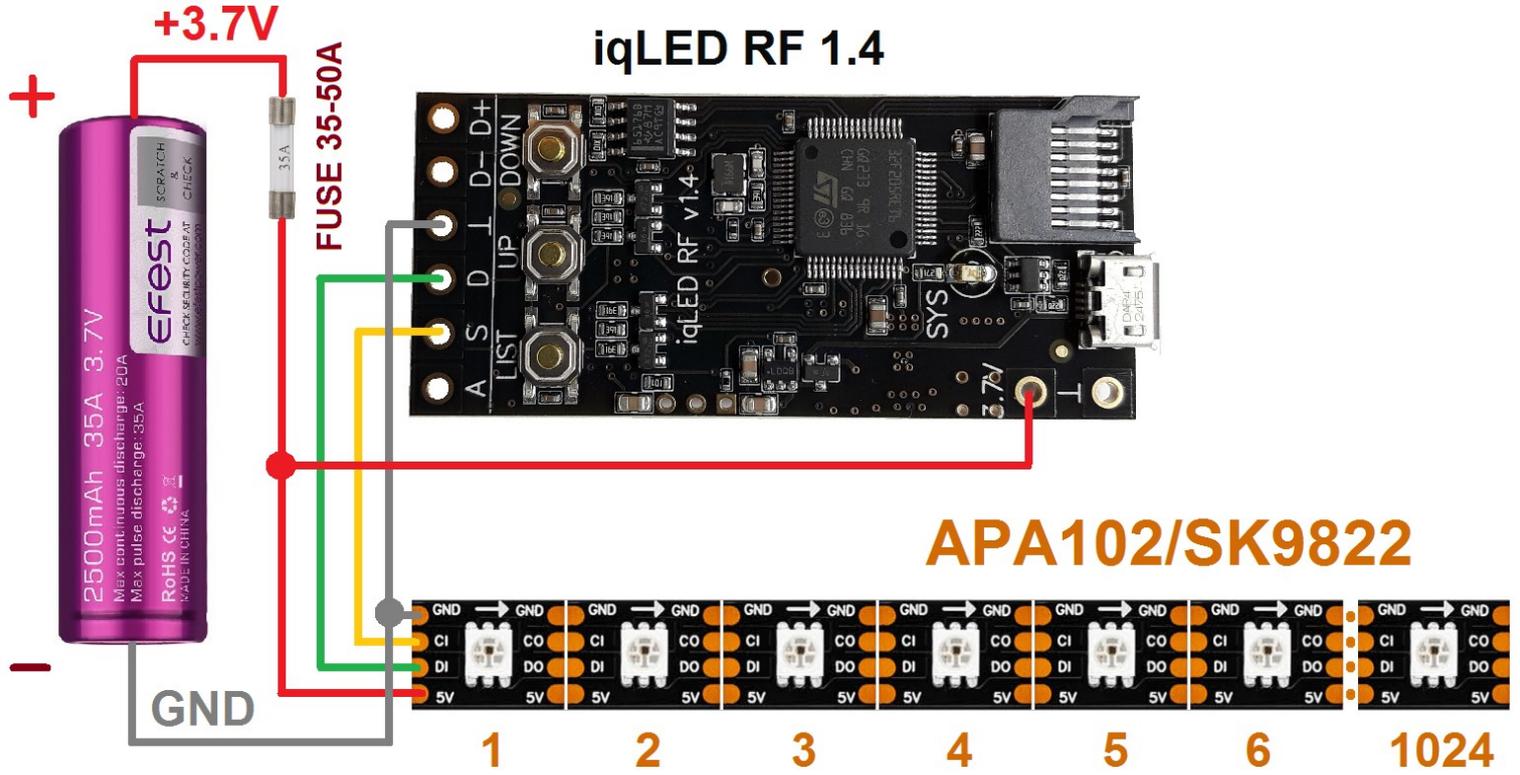


In the image above, the WS2812B LED strip consists of 1024 pixels. If there is a need to connect more pixels, use the scheme below:

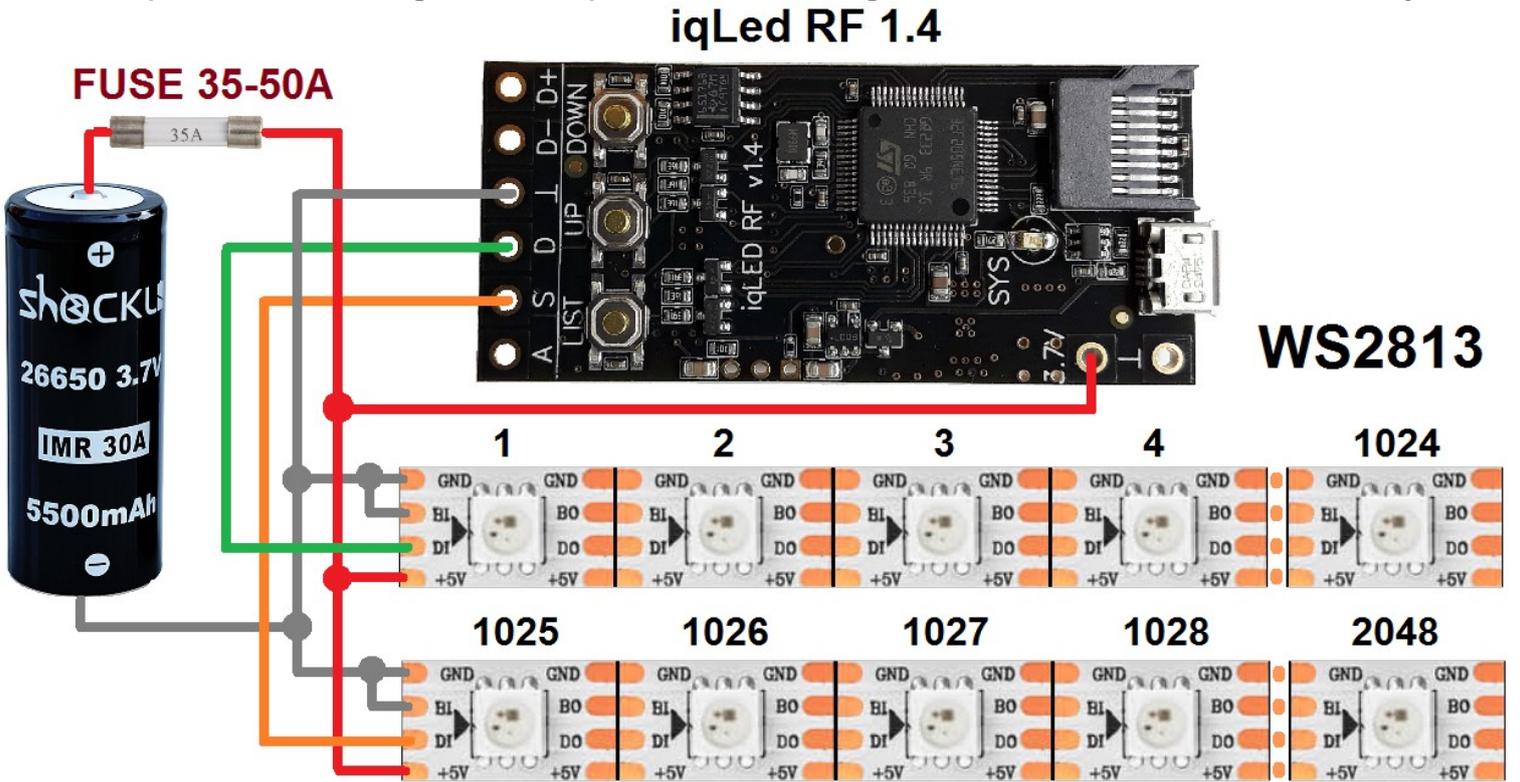


*Note: In this scheme, for connecting 2048 pixels, the DATA OUT 2 port is also used (CLK or S terminal). One pixel WS2812 (B) consumes a maximum current of 0.06A. The total maximum load will be $2048 * 0.06 = 122.88$ A. Thus, use several batteries to evenly distribute the load. Use additional power lines to avoid voltage drops in areas of the LED strip. To reduce the current load, set the "BRIGHTNESS" parameter (brightness) in the controller configuration to no more than 40%.*

An example of connecting APA102 / SK9822 pixels using a Li-ion 18650 3.7V 20A battery.



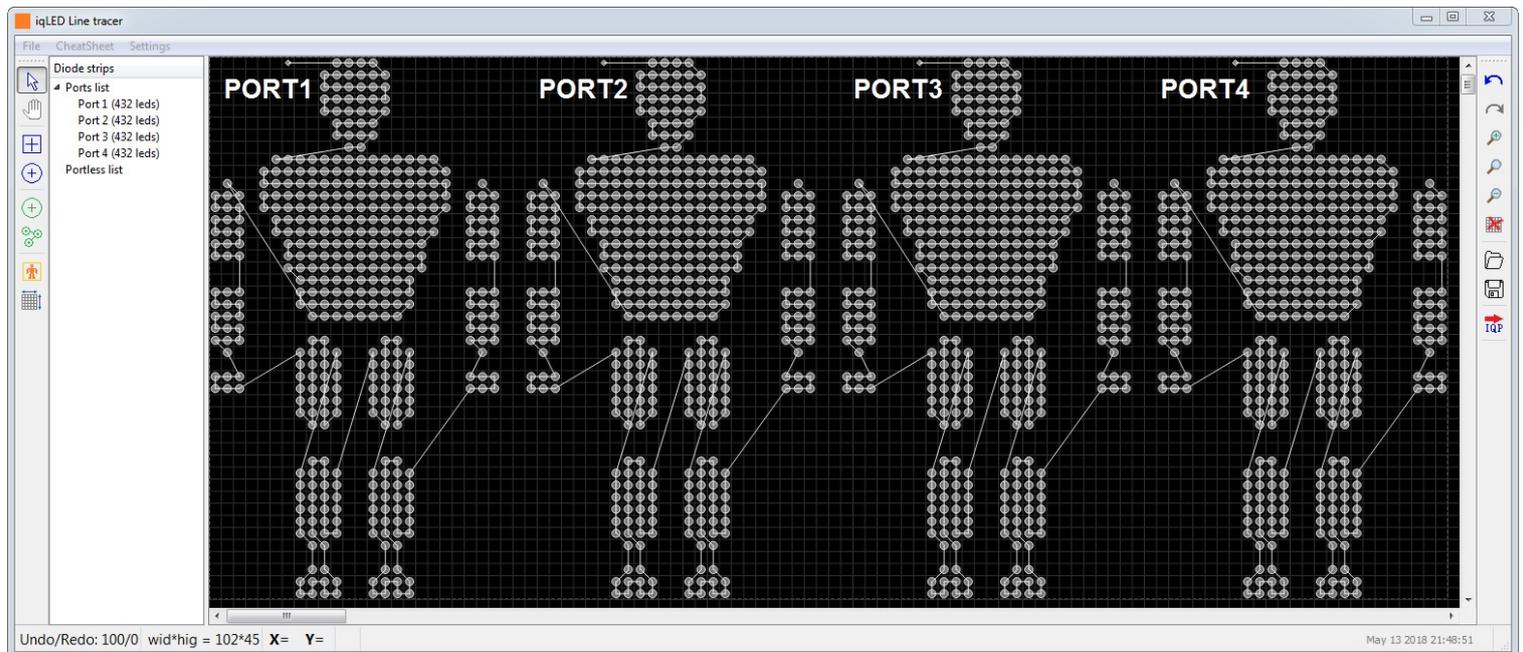
An example of connecting a LED tape WS2813 using a Li-ion 26650 3.7V 30A battery.



Note: In this scheme, the DATA OUT 2 port (CLK or S terminal) is additionally used for connecting the 2048 pixels WS2813. This scheme provides a stable 30 fps at maximum load - 1024 pixels for each port. Connecting more than 1024 pixels to any of the ports will result in lower fps.

Preparation of executable files for iqLED RF v1.x controller

The controller plays programs (color animation) from a microSD card. Animation file extension is *.led. In total, up to 128 animation programs can be recorded on a memory card. To prepare the animation, use the software: Jinx!, Adobe after effects, Adobe flash and the like. The prepared animation file (*.avi, mp4, ...) is converted into a file with *.led extension for playback on the controller. Conversion is performed using **Light Studio Terminal** software. To convert animations, first build a Pixel map of your LED project using the **iqLED Tracer** utility, which is part of the **Light Studio Terminal** software. In the example below, **iqLED Tracer** has developed a simplified pixel map for 4 LED suits.



After building the Pixel map, it needs to be exported to the **Light Studio Terminal** software to grab and further convert the animation from the previously prepared video file. As a result of the animation conversion, we will get a set of 4 executable files (with the *.led extension) for **iqLED RF v1.x** controllers. Thus, you need 4 **iqLED RF v1.x** controllers (1 pc. per suit) for the operation of a group of such suits.

For more information on the **Light Studio Terminal** software and **iqLED Tracer**, please refer to the user manual.

Names of playable files and sorting

As a result of grabbing the animation, **Light Studio Terminal** creates files with the *.led extension. For example, according to the picture above, there are 4 pixel maps in the form of LED suits. When grabbing an animation from the file fire_001.avi, we will get 4 files with the *.led extension at the output:

PORT-1-fire_001.led
 PORT-2-fire_001.led
 PORT-3-fire_001.led
 PORT-4-fire_001.led

Further, when grabbing the waterfall_002.avi animation, we will get the following 4 files with the *.led extension at the output:

PORT-1-waterfall_002.led
 PORT-2-waterfall_002.led
 PORT-3-waterfall_002.led
 PORT-4-waterfall_002.led

As a result, for 4 LED suits, the set of playable files for 5 different animations will look like this:

Controller №1 (PORT1)	Controller №2 (PORT2)	Controller №3 (PORT3)	Controller №4 (PORT4)
			
PORT-1-fire_001.led PORT-1-waterfall_002.led PORT-1-rainbow_003.led PORT-1-stars_004.led PORT-1-blizzard_005.led	PORT-2-fire_001.led PORT-2-waterfall_002.led PORT-2-rainbow_003.led PORT-2-stars_004.led PORT-2-blizzard_005.led	PORT-3-fire_001.led PORT-3-waterfall_002.led PORT-3-rainbow_003.led PORT-3-stars_004.led PORT-3-blizzard_005.led	PORT-4-fire_001.led PORT-4-waterfall_002.led PORT-4-rainbow_003.led PORT-4-stars_004.led PORT-4-blizzard_005.led

The full file name (including period and extension) must not contain more than 31 characters. For example,

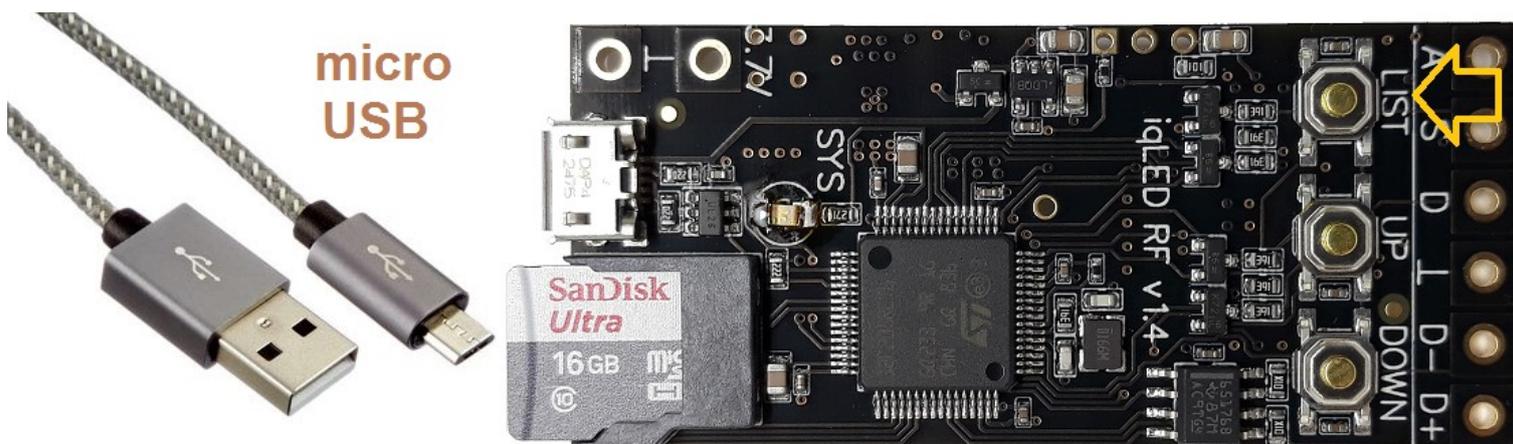
PORT-1-rainbow_001.led	22 characters total - OK
PORT-4-Combat-Landings_002.led	30 characters total - OK
PORT-2-Combat-Landings_003.led	30 characters total - OK
PORT-3-Flowering-meadows_005.led	32 characters - NOT OK (error - overflow)

The controller sorts files by the character "_" underscore followed by three characters: 001, 002 and so on up to 128.

Do not use the "_" underscore character in the file name more than once. Example: PORT-1-Flowering_meadows_005.led. Such a file will be ignored by the controller, since it contains two "_" underscore characters.

Using an integrated card reader

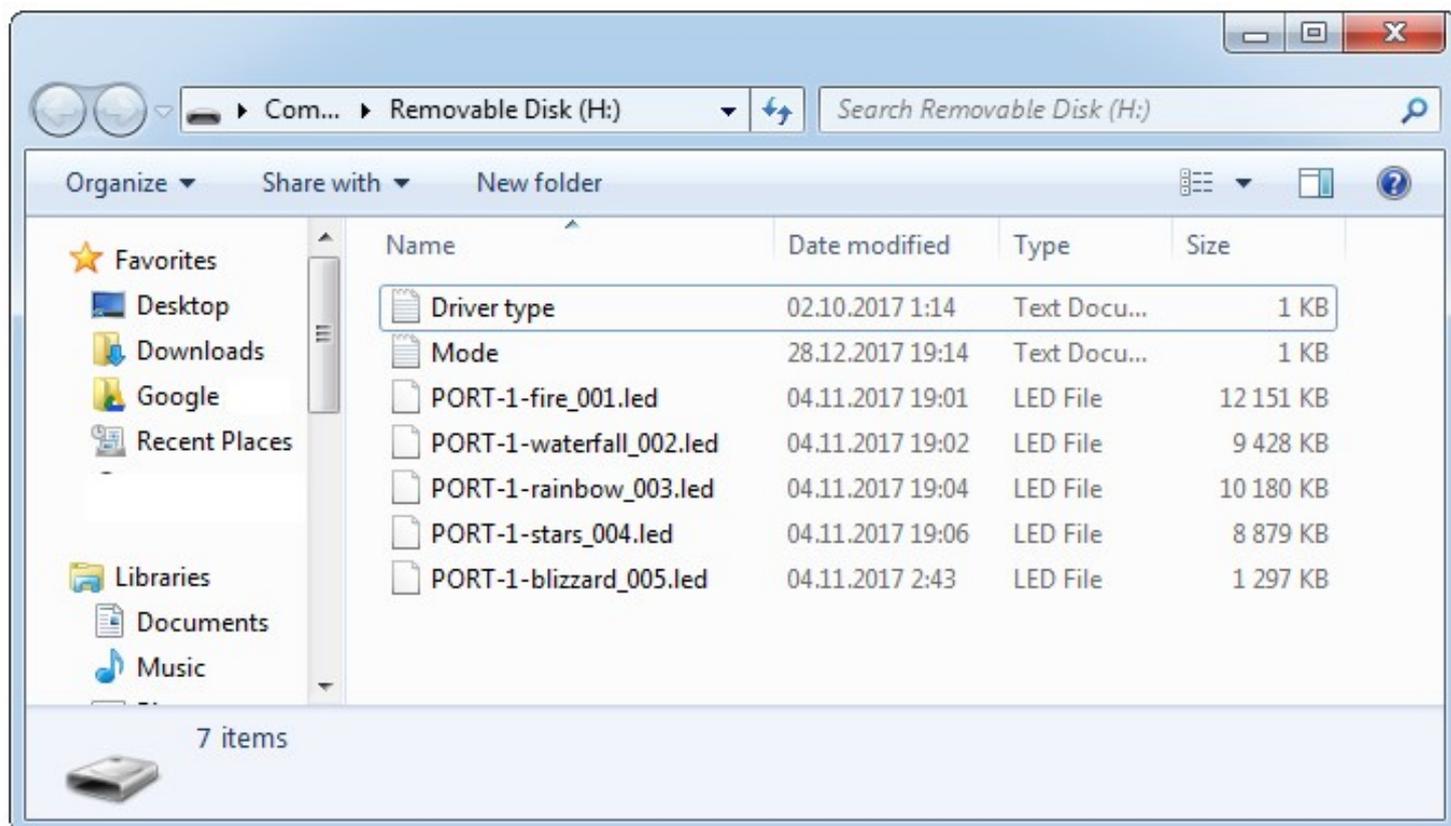
To work with files on a microSD card, you can use a card reader integrated into the controller. To connect to a PC you will need a **micro USB - USB** cable.



To enter **USB Card Reader** mode:

- 1 - disconnect the external power supply of the controller;
- 2 - install the microSD card in the slot holder;
- 3 - hold the **LIST** button down and connect the device to the computer with a **micro USB - USB** cable.
- 4 - release the **LIST** button.

A removable disk will appear among the computer disks.



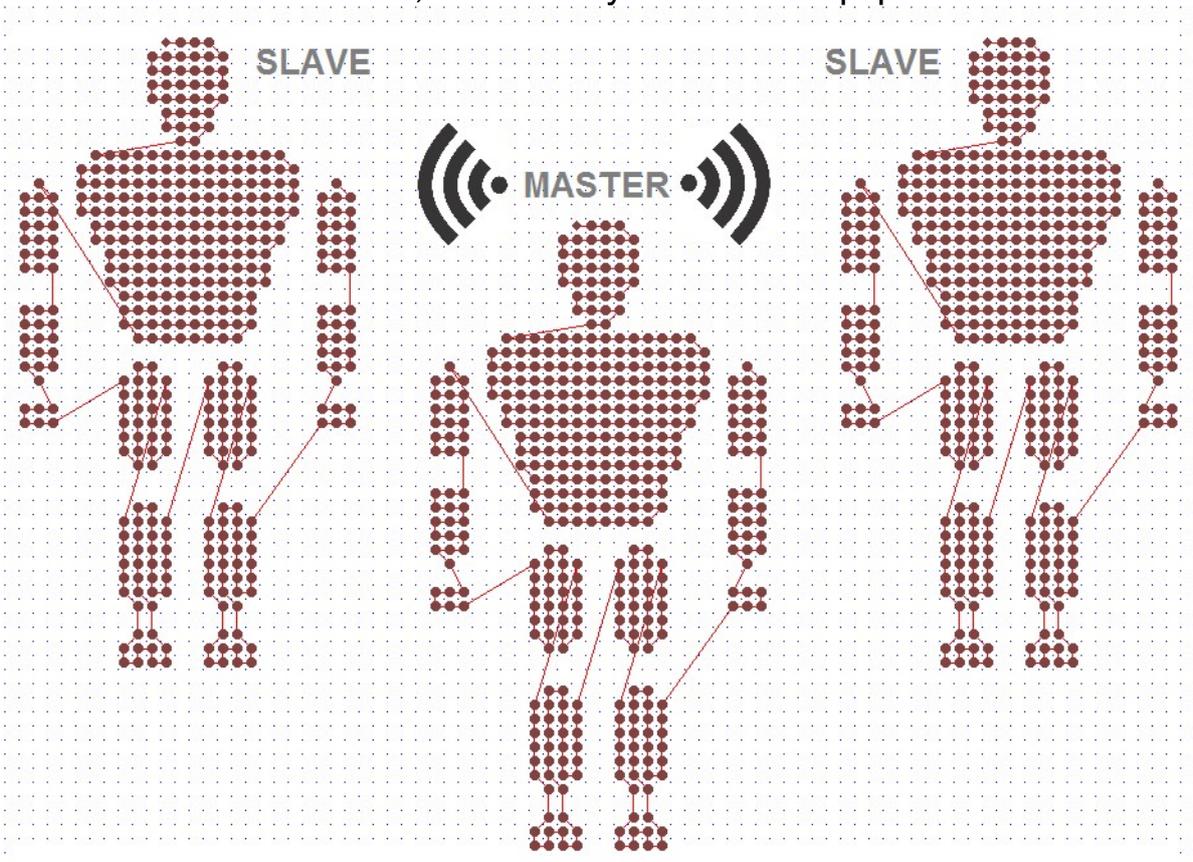
Note:

* use the **FAT32** or **exFAT** file system.

* installation of drivers for this mode is not required.

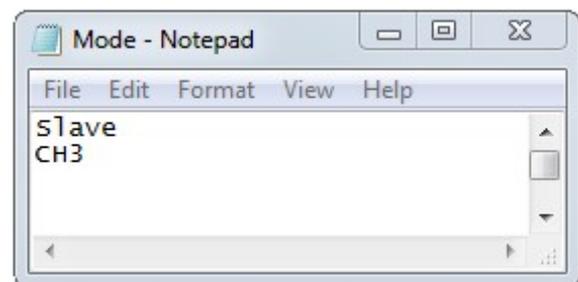
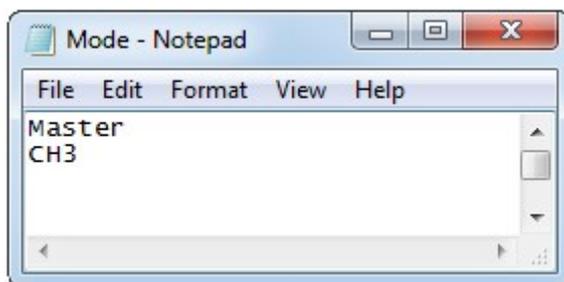
Using of radio synchronization

The technical capabilities of the **iqLED RF v1.x** controller allow operation of devices in a group. One controller is assigned to "Master", the rest - "Slave". The controller can operate in both "Master" and "Slave" mode, without any additional equipment.



Radio communication is carried out only for the synchronization of devices, without transmitting any content. The "Master" controller is able to steadily synchronize countless number of "Slave" controllers that are within 150-200 meters from the "Master" controller. The maximum distance from the Master Slave is 1500 meters when using a directional antenna.

To assign a "Master" controller, use the following settings:
create a text file Mode.txt, in which specify the keyword Master (picture on the left).



In the line below, indicate the number of the radio channel from the list: CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8. Those. only 8 channels to choose from. To assign a slave controller use the following settings: create a text file Mode.txt, in which specify the keyword Slave (the picture on the right). In the next line, specify the number of the radio channel, **the same as you indicated for the "Master"**. For visual configuration of controllers, use the **iq-led-device-cfg-1.xx.exe** utility.

The corresponding configuration files: copy Mode.txt to the root directory of the microSD card controllers. If the slave controllers during group work experience instability in radio

reception, it is recommended to replace the selected radio channel with another one from the list: CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8 (replacement of both Master and Slave controllers).

After assigning Master / Slave, we have the following set of files:

Controller №1 (PORT1) Master	Controller №2 (PORT2) Slave	Controller №3 (PORT3) Slave	Controller №4 (PORT 4) Slave
			
Mode.txt Driver type.txt PORT-1-fire_001.led PORT-1-waterfall_002.led PORT-1-rainbow_003.led PORT-1-stars_004.led PORT-1-blizzard_005.led	Mode.txt Driver type.txt PORT-2-fire_001.led PORT-2-waterfall_002.led PORT-2-rainbow_003.led PORT-2-stars_004.led PORT-2-blizzard_005.led	Mode.txt Driver type.txt PORT-3-fire_001.led PORT-3-waterfall_002.led PORT-3-rainbow_003.led PORT-3-stars_004.led PORT-3-blizzard_005.led	Mode.txt Driver type.txt PORT-4-fire_001.led PORT-4-waterfall_002.led PORT-4-rainbow_003.led PORT-4-stars_004.led PORT-4-blizzard_005.led

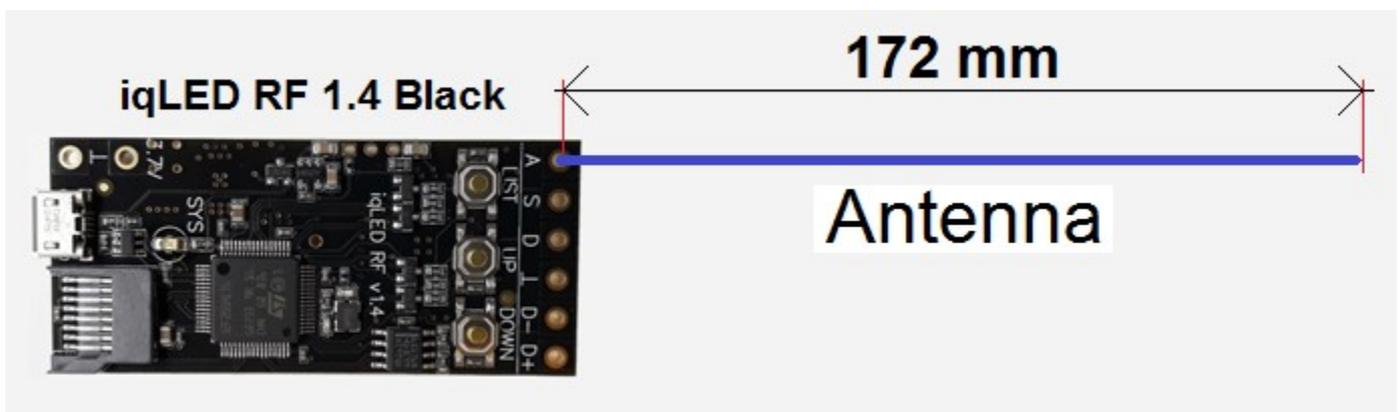
For the controller, which is configured as Master, external control from the PC via the USB port is available, the program switching functions are the buttons "UP" and "DOWN". The playlist (file list) function is also available, it is activated by the "LIST" button.

In the "Slave" configuration, in the animation playback mode, all controller buttons are locked.

When grouping controllers, only one controller can be assigned as **Master**.

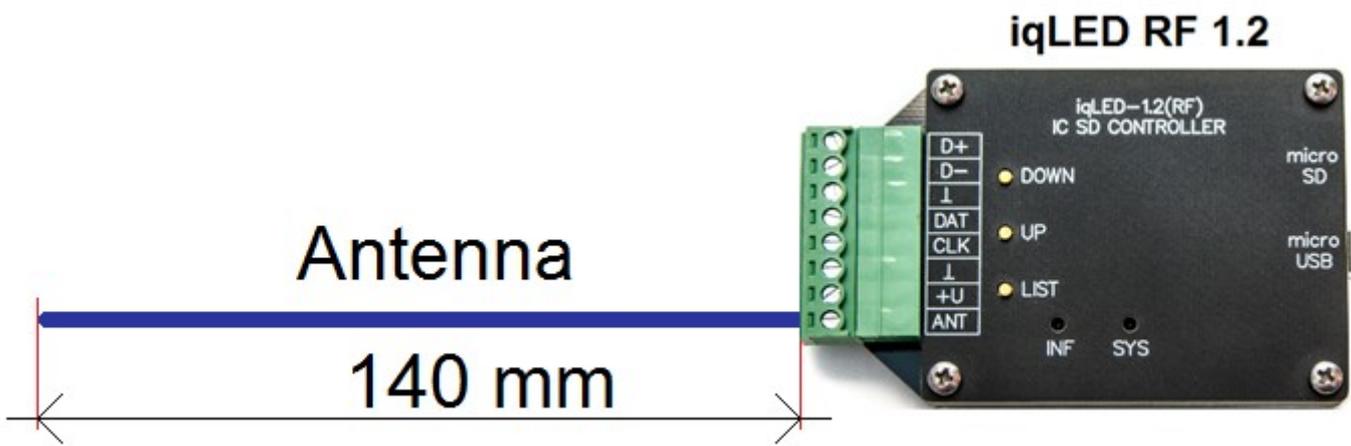
Radio antenna

For iqLED RF 1.4 Black controller, solder a piece of thin ($D = 0.3 \dots 1.0 \text{ mm}$) flexible installation wire to the specified point (A), preferably with external insulation, 172 mm long. For better radio reception, the error in the antenna length should not exceed $\pm 3 \text{ mm}$.



This antenna will provide reliable reception within 100-200 meters

For the iqLED RF 1.2 controller, fasten a piece of a thin ($D = 0.3 \dots 1.0 \text{ mm}$) flexible installation wire, preferably with external insulation, 140 mm long to the specified terminal (ANT). For better radio reception, the error in length should not exceed $\pm 3 \text{ mm}$.

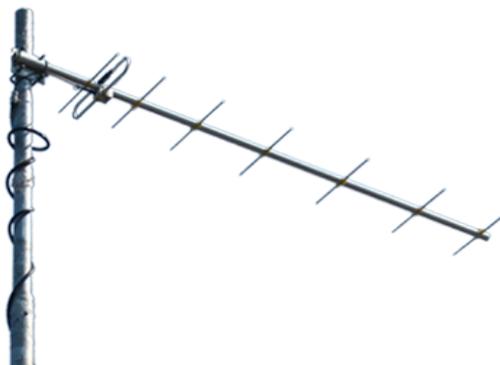


This antenna will provide reliable reception within 100-200 meters.

At significant distances (more than 500 meters) of the "Master" controller from the "Slave" controller, use specialized antennas at a frequency of 433 MHz.



Directional antennas will allow you to confidently work on removal up to 1000 - 1500 meters.

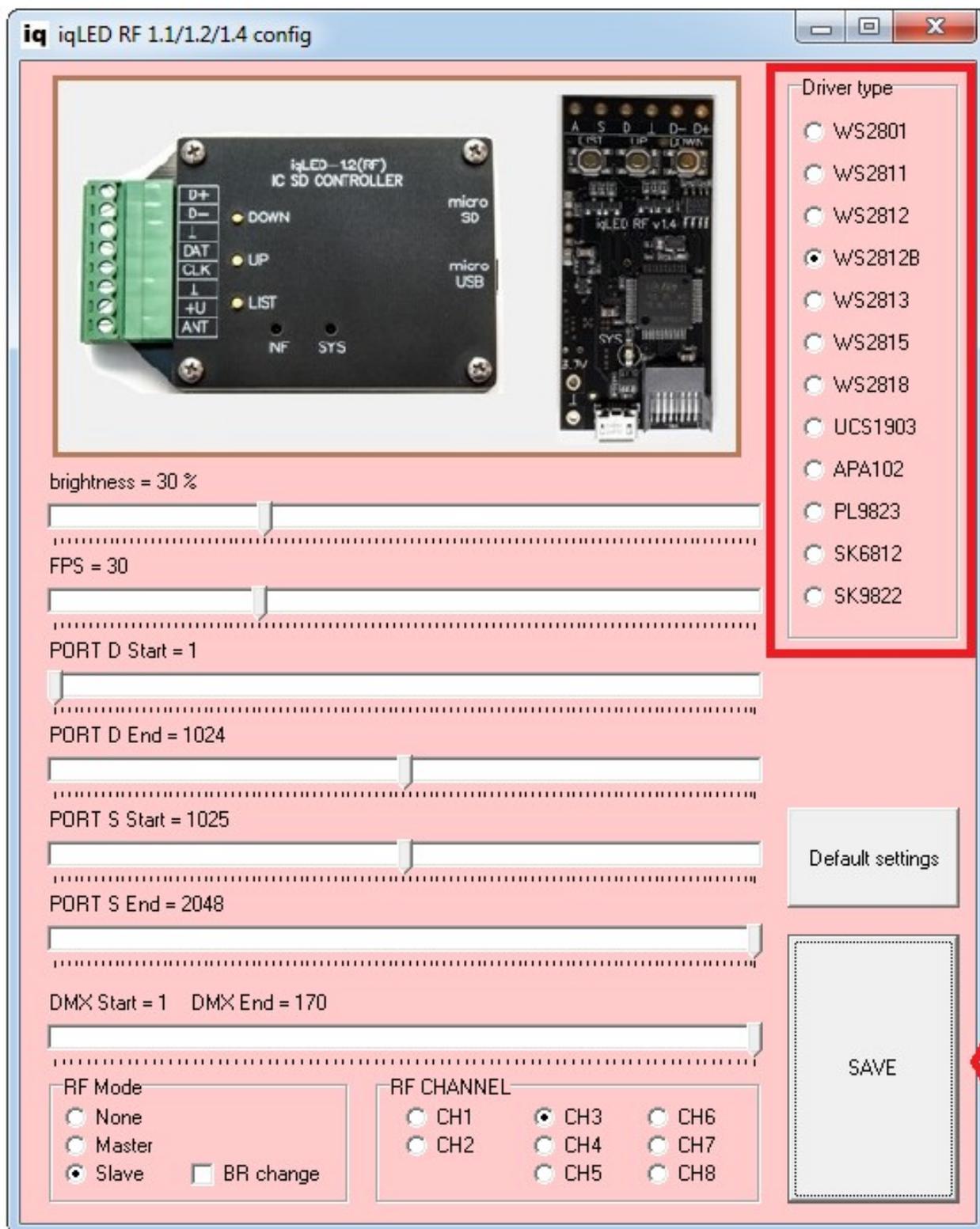


Operating procedure with the SD card

The device supports microSD media up to 32GB. The file system should be FAT32 or exFAT (preferred).

Configuration of the type of LED driver controlled by the Smart pixel.

Use the **iq-led-device-cfg-1.xx** utility to visually configure the controller. In the panel (1), select the type of driver to be used. Using the Save (2) button, save the configuration (Driver type.txt and Mode.txt files) in the root directory of the controller's microSD card.



iq iqLED RF 1.1/1.2/1.4 config

iqLED-12(RF)
IC SD CONTROLLER

micro SD
micro USB

DOWN
UP
LIST

NF SYS

A S D L D- D+
CPST TP DTMW

iqLED RF v1.4 FTTH

Driver type

- WS2801
- WS2811
- WS2812
- WS2812B
- WS2813
- WS2815
- WS2818
- UCS1903
- APA102
- PL9823
- SK6812
- SK9822

brightness = 30 %

FPS = 30

PORT D Start = 1

PORT D End = 1024

PORT S Start = 1025

PORT S End = 2048

DMX Start = 1 DMX End = 170

RF Mode

- None
- Master
- Slave

BR change

RF CHANNEL

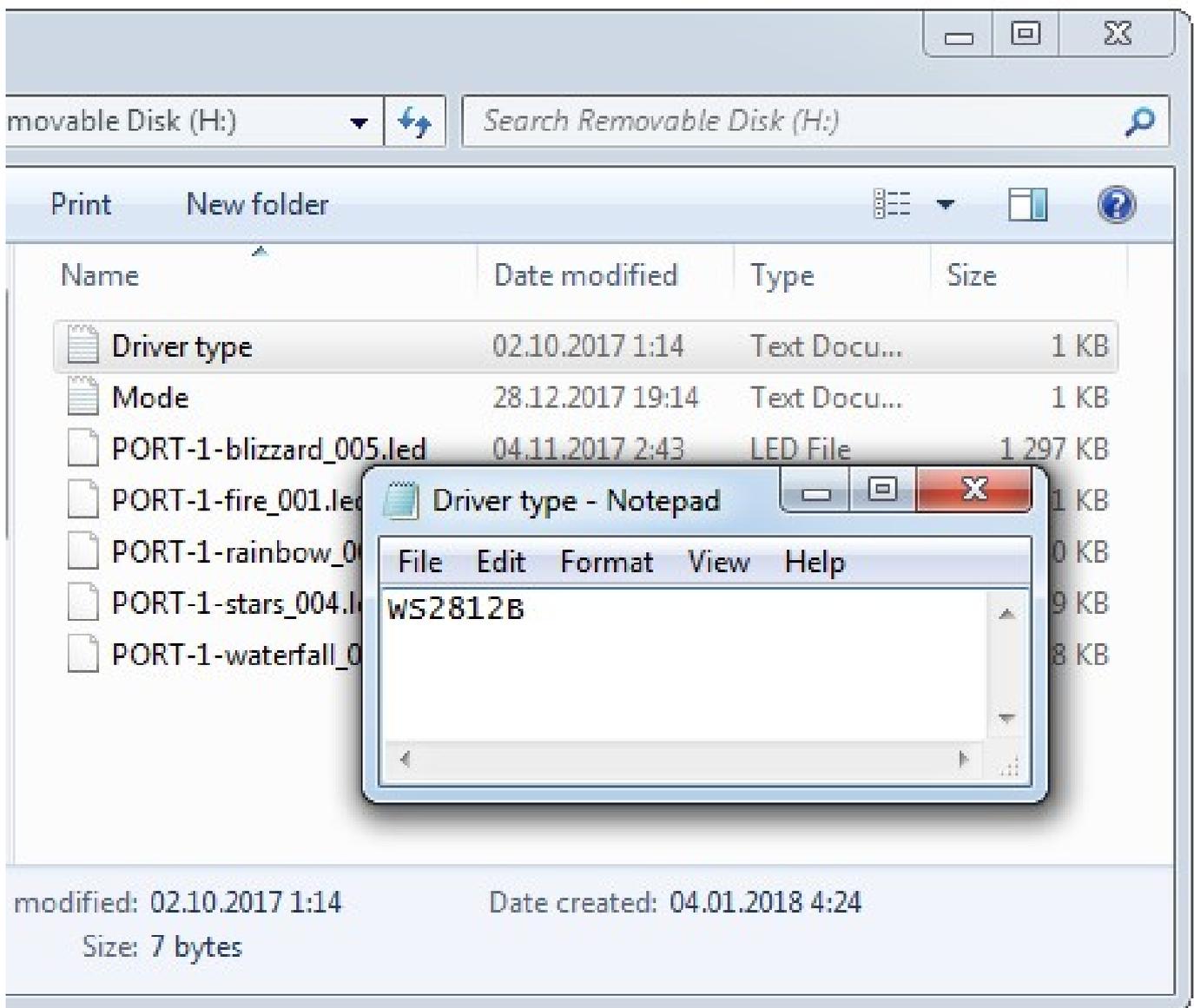
- CH1
- CH3
- CH6
- CH2
- CH4
- CH7
- CH5
- CH8

Default settings

SAVE

1

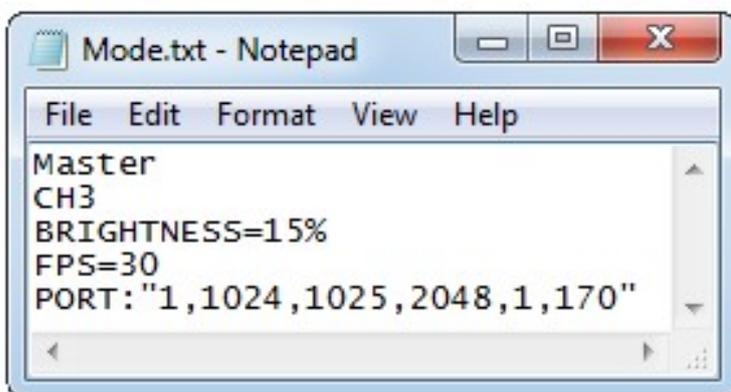
2



As a result, 2 files will appear on the SD card:

Driver type.txt - stores the type of the connected LED driver

Mode.txt - stores the configuration and other controller settings:



1 - radio configuration (RF Mode panel).

the controller can be configured as: Master, Slave or None.

Master - master radio controller;

Slave - slave radio controller;

None - radio is disabled.

2 radio channel number (RF CHANNEL panel).

may be within: CH1..CH8.

For reference:

RF channel	Frequency, MHz
Channel #1 (CH1)	433.075
Channel #2 (CH2)	433.100
Channel #3 (CH3)	433.200
Channel #4 (CH4)	433.300
Channel #5 (CH5)	433.350
Channel #6 (CH6)	433.475
Channel #7 (CH7)	433.625
Channel #8 (CH8)	433.800

3 - BRIGHTNESS (brightness selection slider), can be configured in the range of 0..100%.

Note.

Reducing the brightness significantly reduces the electrical energy consumption of the connected pixels, and as a result, extending the battery life. Also this option is useful for night pixel mode or when shooting with a video camera.

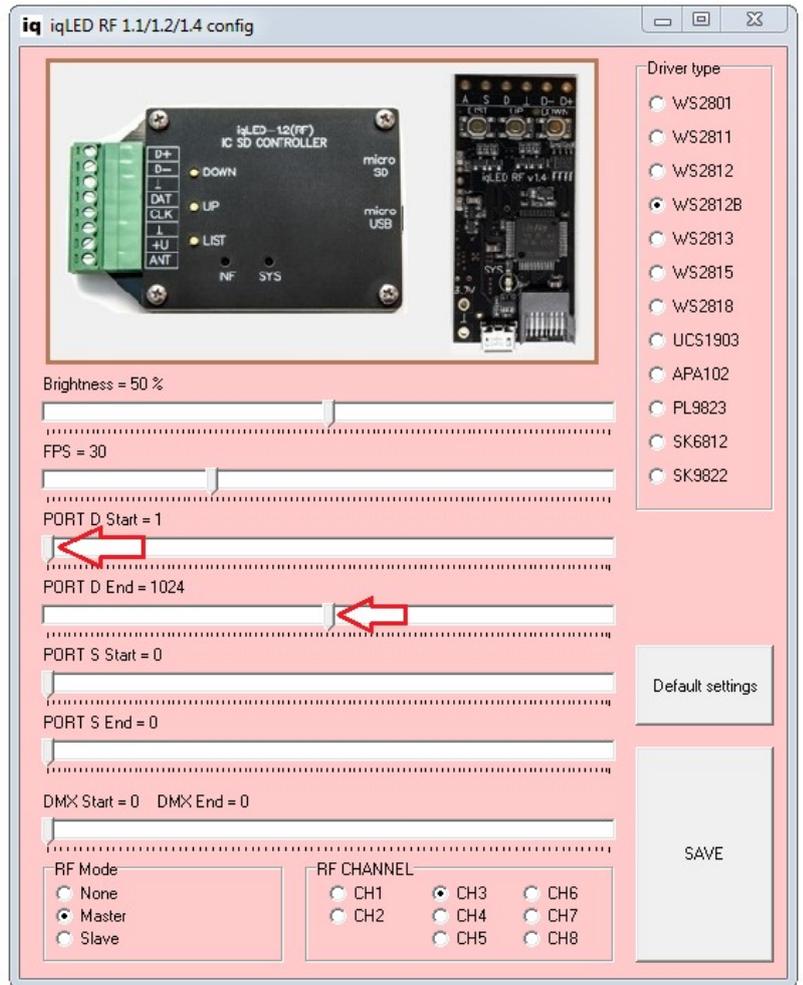
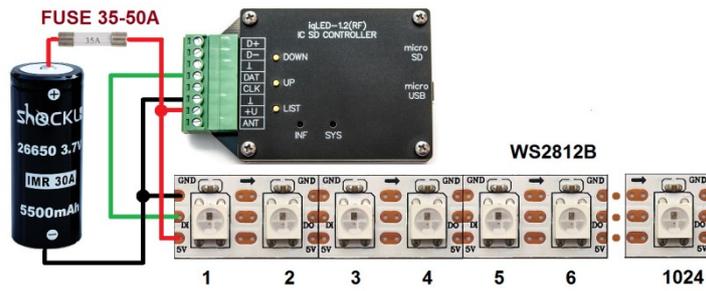
4 - FPS (frame rate slider), can be configured in the range of 1..100 frames / sec.

5 PORT - port configuration (PORT D and PORT S sliders).

Both smart pixels and DMX decoders can be connected to the controller as slaves. Connecting smart pixels and DMX decoders can be both separately and jointly. For maximum performance, the controller has a dual IC port (terminals D and S) to which smart pixels are connected. To connect DMX decoders use one differential port (terminals D + and D-).

Consider a few examples of configuration modes and ports D, S and DMX.

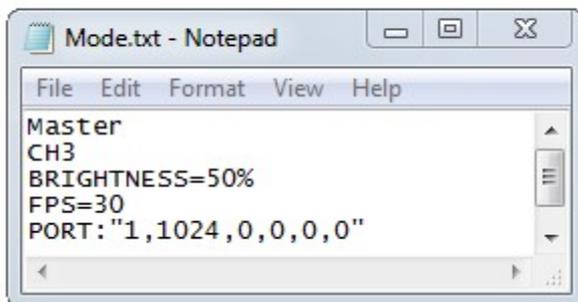
A) Only one WS2812B LED strip is connected to port D of the controller, with 1024 pixels.



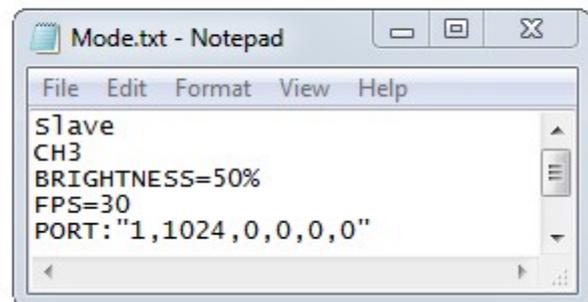
The command line in the Mode.txt generated configuration file will be as follows:
PORT:"1,1024,0,0,0,0"

The full contents of the configuration file for the Master and Slave controller modes will be as follows:

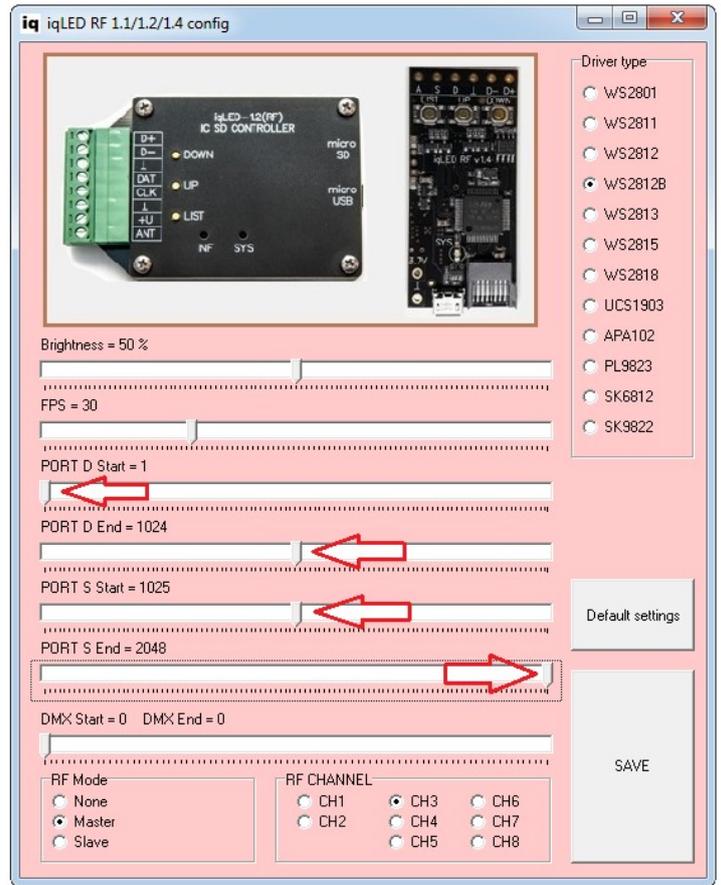
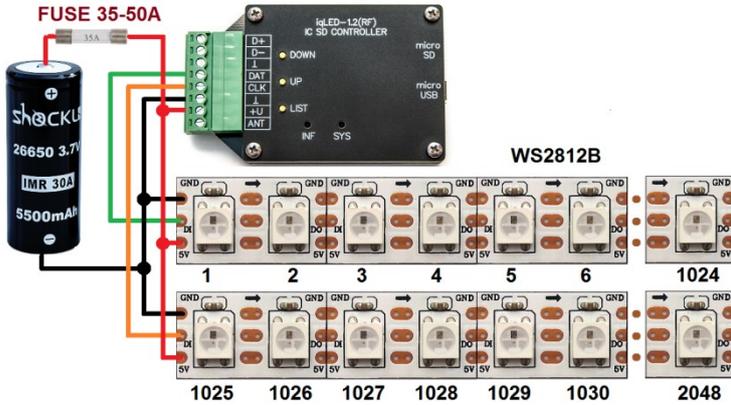
Master MODE



Slave MODE



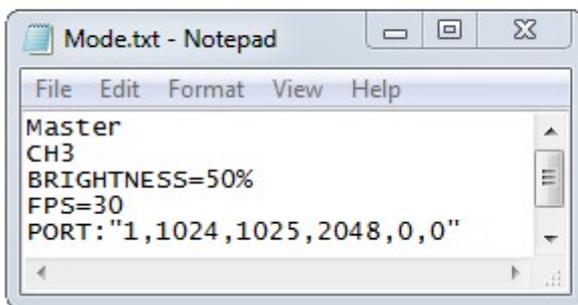
B) Two WS2812B LED strips, 1024 pixels each, are connected to the controller. Pixels 1 through 1024 are connected to the DAT (D) port, the pixels 1025 through 2048 are connected to the CLK (S) port.



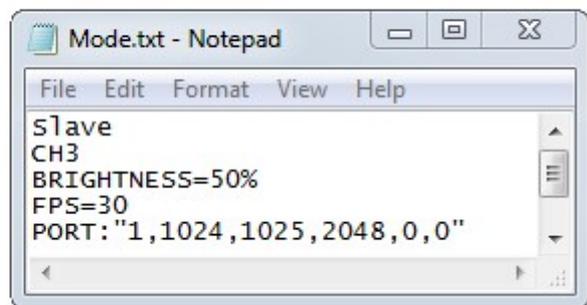
The command line in the Mode.txt generated configuration file will be as follows:
PORT:"1,1024,1025,2048,0,0

The full contents of the configuration file for the Master and Slave controller modes will be as follows:

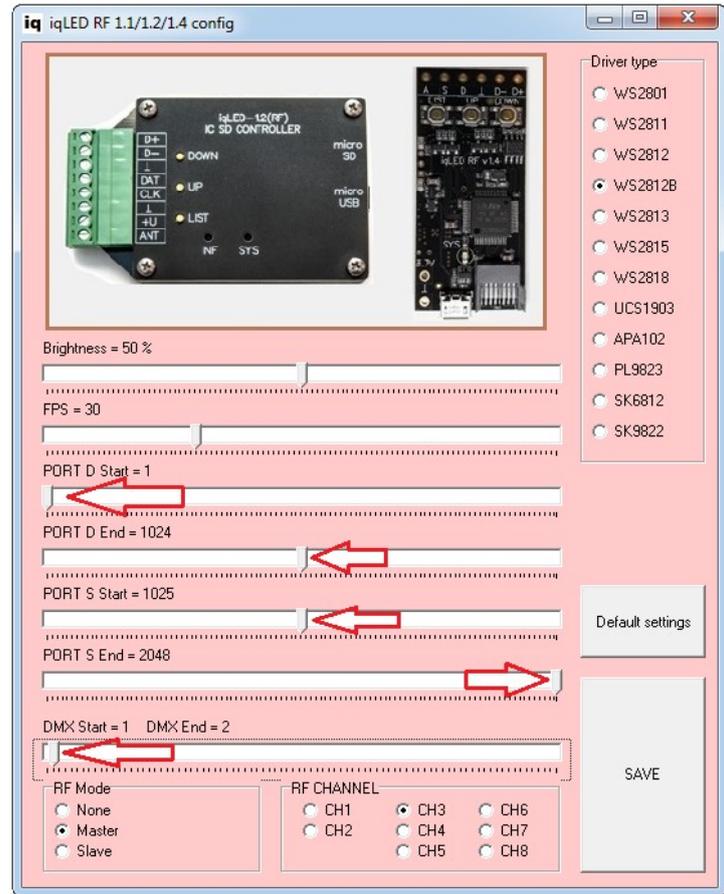
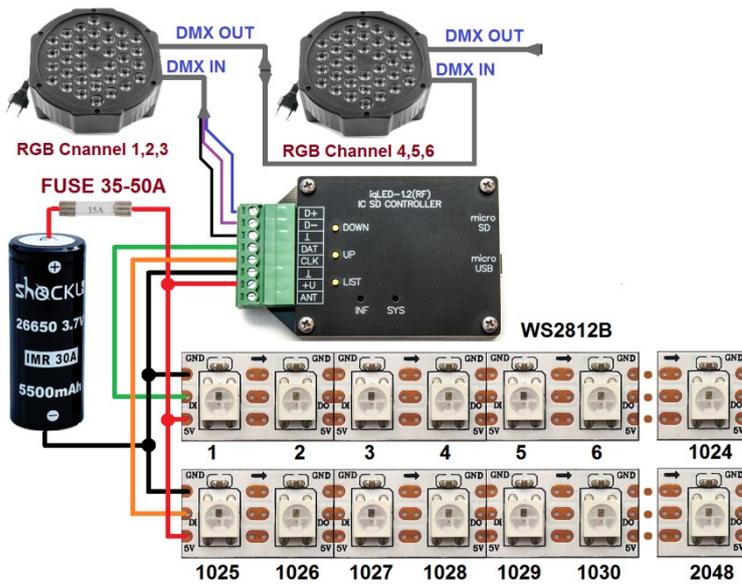
Master MODE



Slave MODE



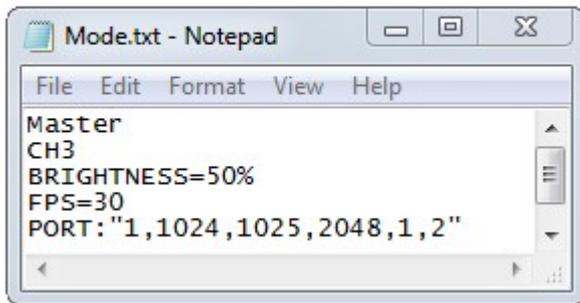
C) Two WS2812B tapes and two RGB DMX spotlights are connected to the controller.



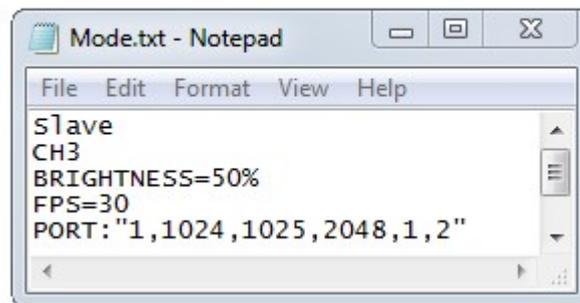
The command line in the Mode.txt generated configuration file will be as follows:
PORT:"1,1024,1025,2048,1,2"

The full contents of the configuration file for the Master and Slave controller modes will be as follows:

Master MODE



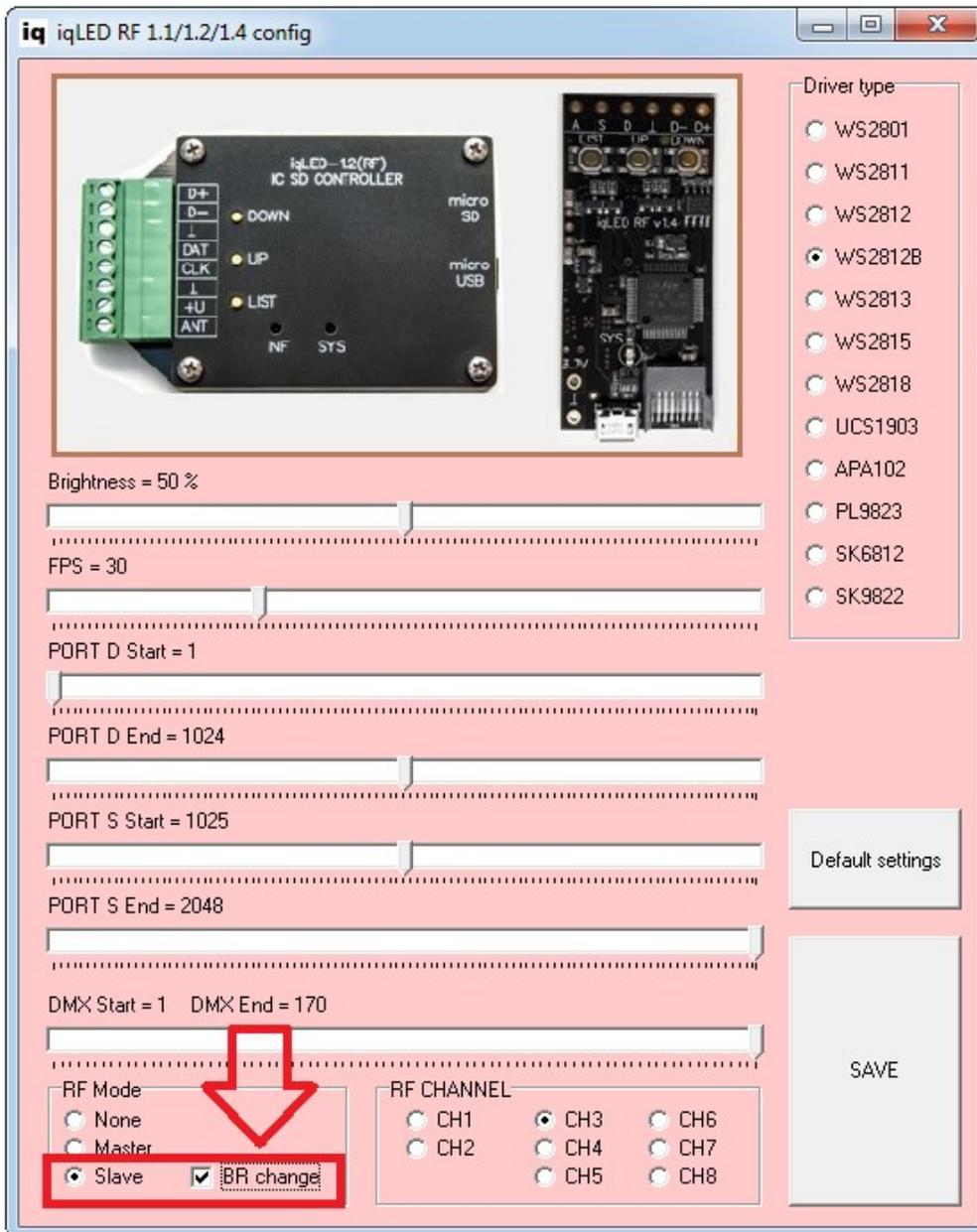
Slave MODE



Note. The brightness and configuration of the ports of Master and Slave controllers may vary.

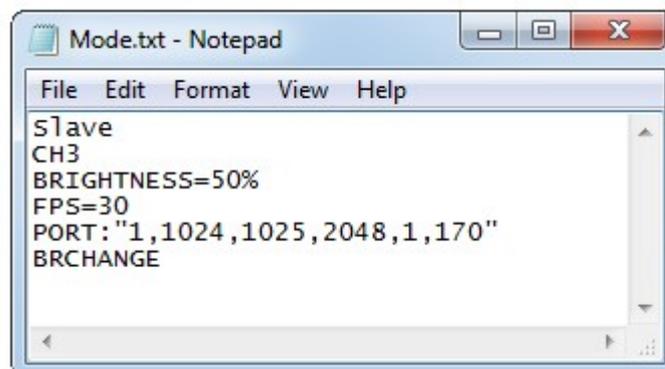
The FPS and the number of the radio channel (CH1 ... CH8) must be the same in both the "Master" and the "Slave" controllers.

D) The controller is configured as Slave with the brightness being set by radio from the Master controller command.



This mode is activated by setting the BR change checkbox.

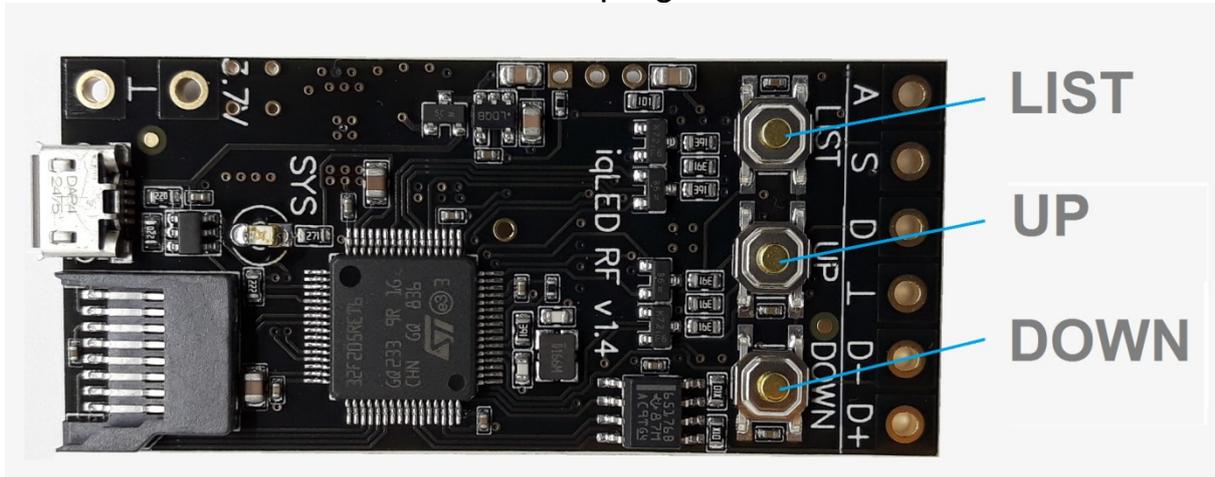
The full contents of the configuration file for the Slave mode will be as follows:



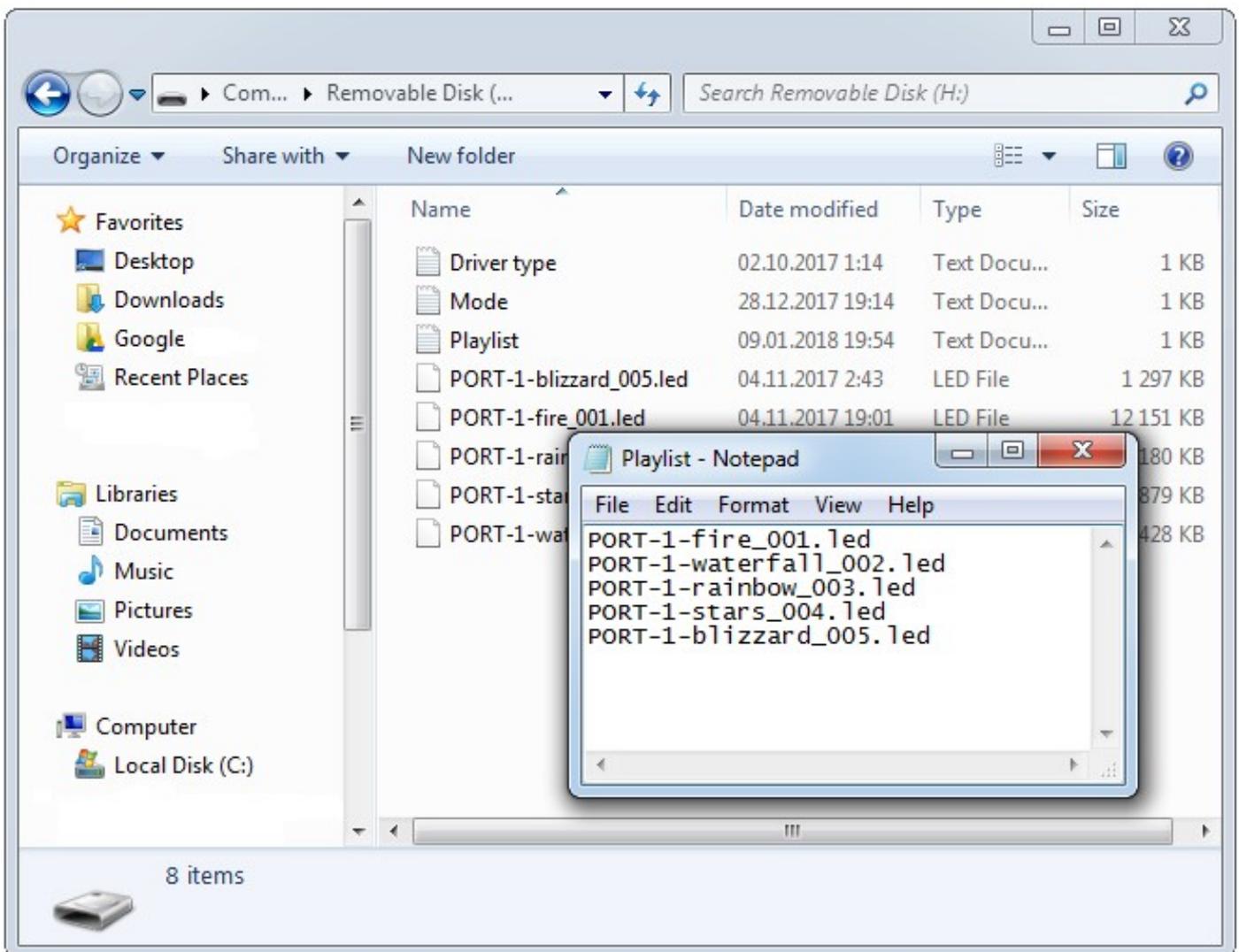
This feature will be useful if you plan to quickly change the brightness of the whole group of Slave controllers, by changing the brightness setting in only one Master controller.

Switching of programs and playing the file list

Use the buttons "UP" and "DOWN" to switch programs.



The controller also allows to loop through the playlist. To do this, create Playlist.txt text file and record the list of required files.



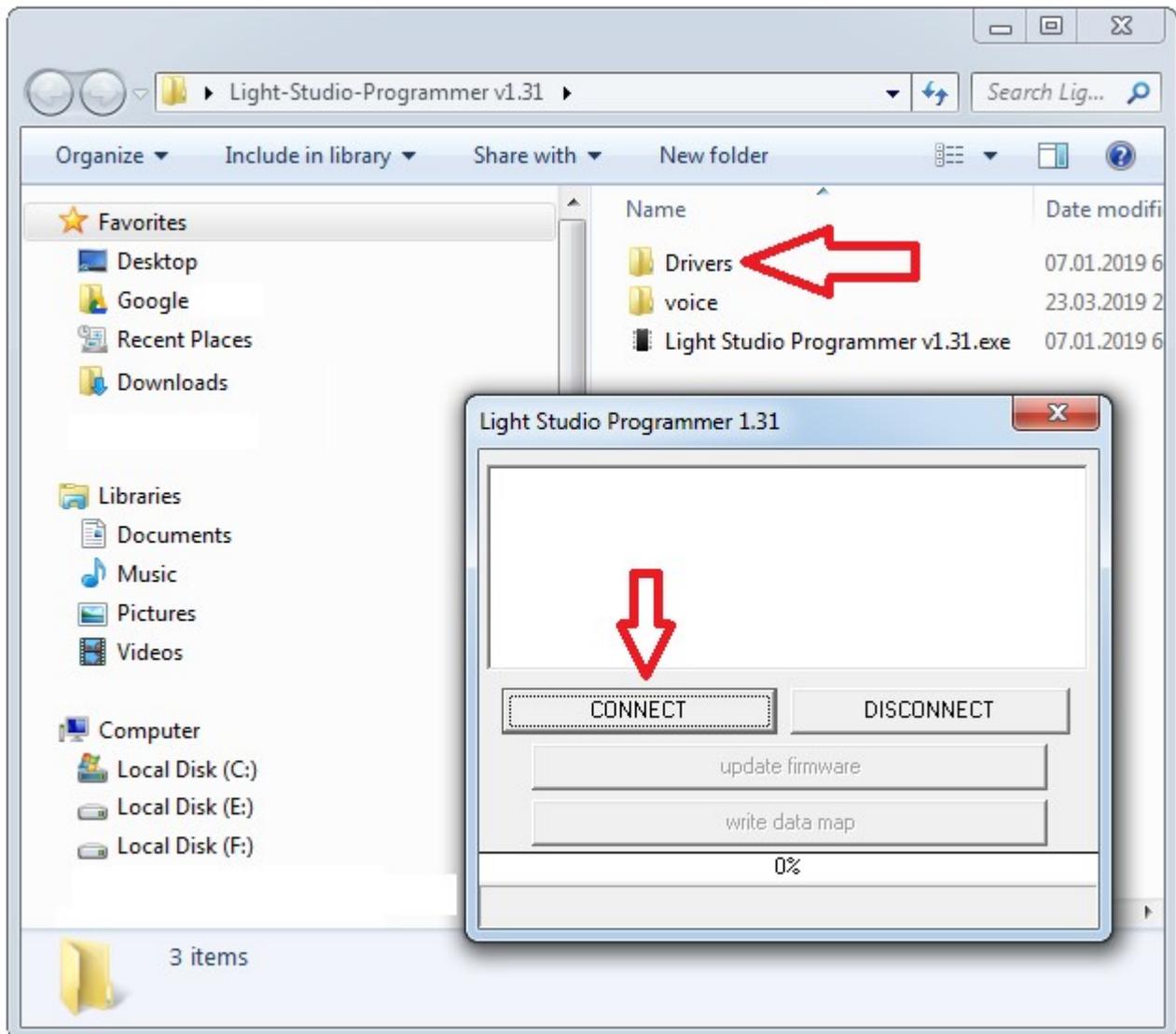
Press the LIST button in the controller operating mode to activate the Playlist mode.

The maximum number of entries in the Playlist.txt file is 128. The full file name (including full stop and extension) must not contain more than 31 characters, see the **“Playable files and sorting”** section.

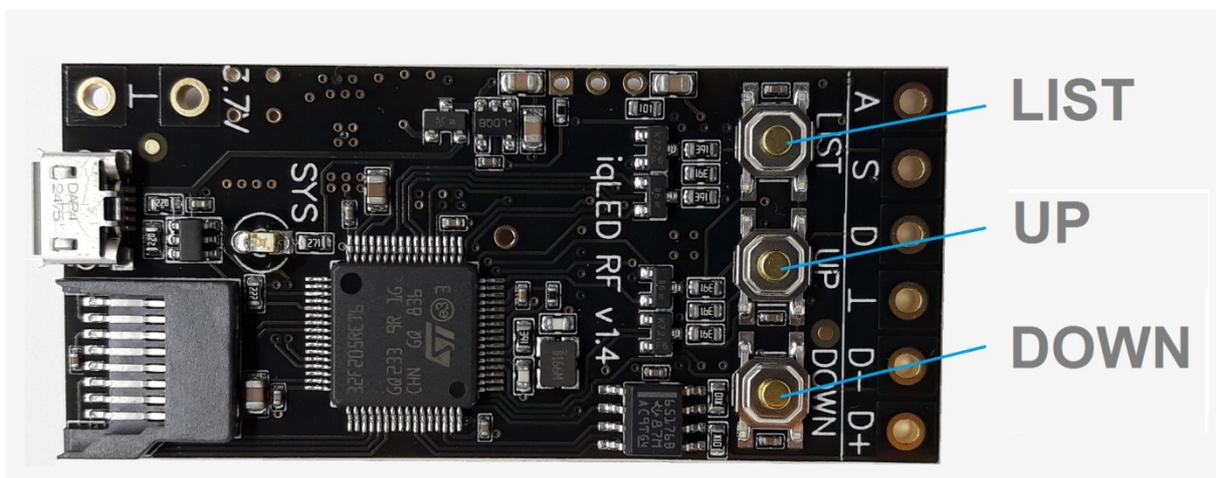
Device firmware update

The Light Studio Programmer software version 1.31 and higher is used to update the controller firmware.

1. Install the virtual COM port driver from the Drivers folder.

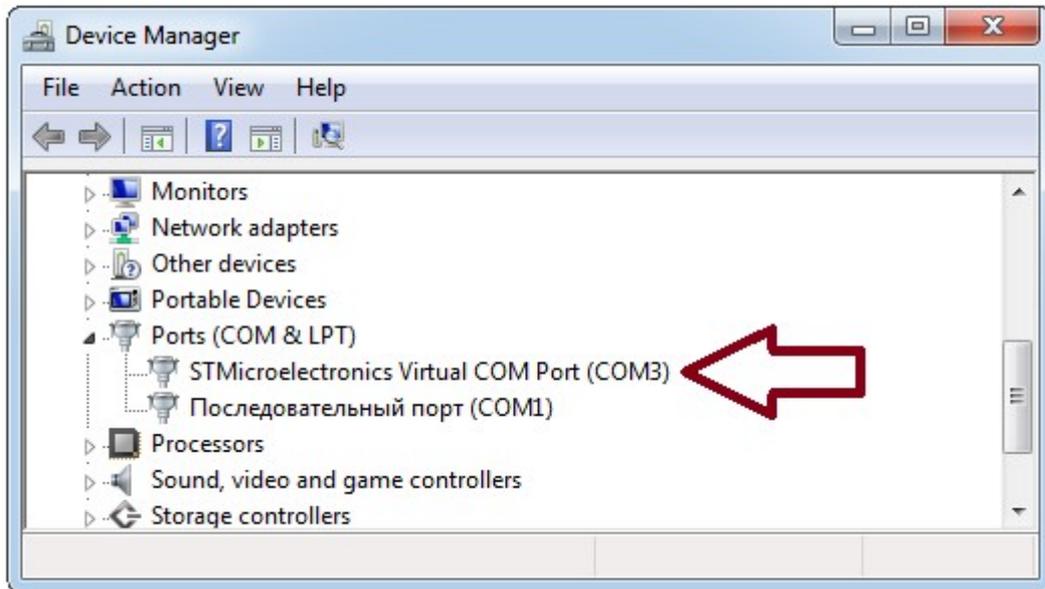


2. Hold the DOWN or UP button and connect the device to the computer using a USB cable to enter the controller in firmware update mode. **Power supply via the + U or 3.7V terminal, as well as the DMX bus must be disconnected.**

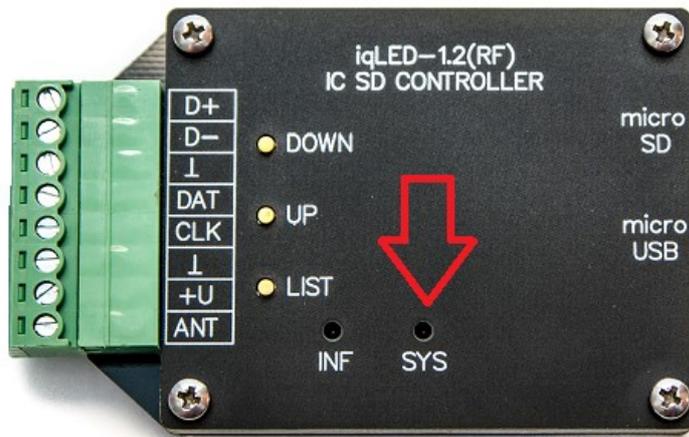


After connecting to USB, release the button.

The STMicroelectronics Virtual COM Port device should appear in the device manager.



The system indicator in the firmware update mode should flash at intervals of 10 times per second.

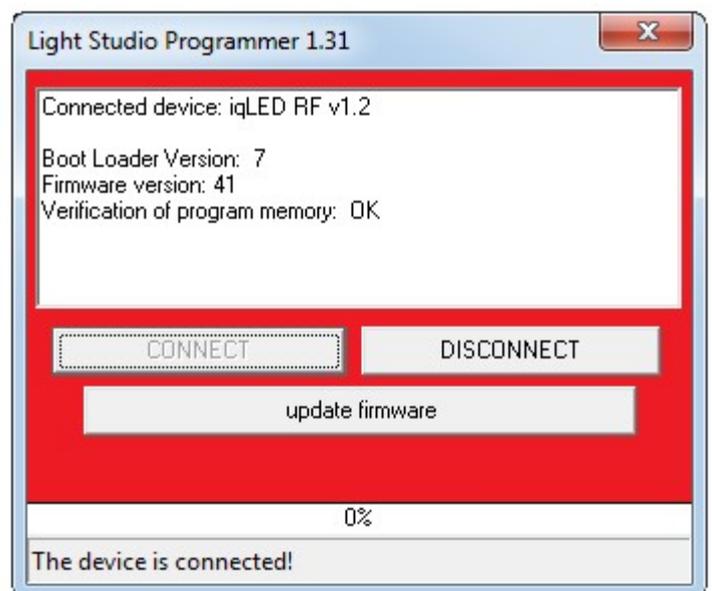


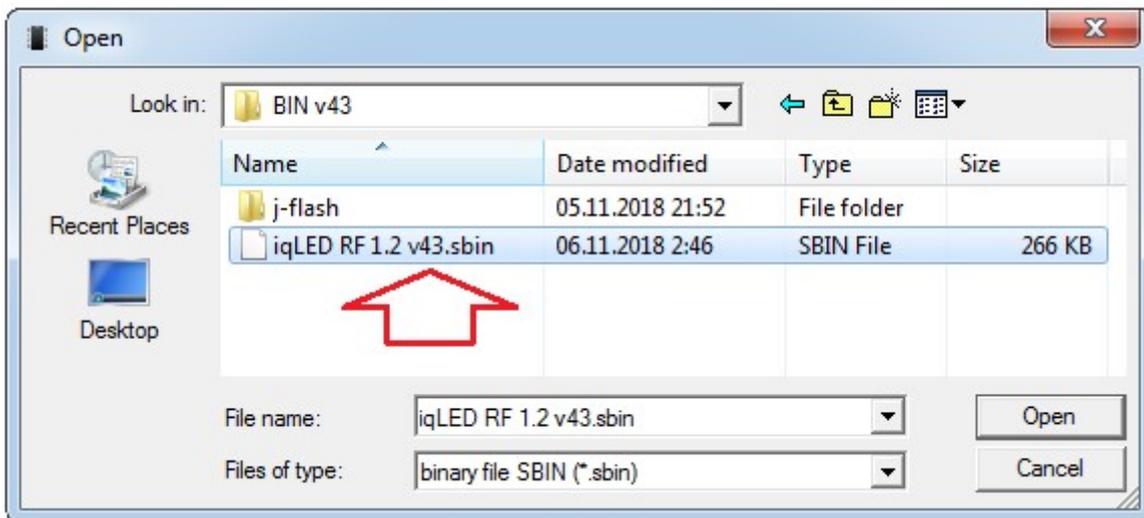
3. Press the CONNECT button.

The programmer should display the full name of the connected device, the bootloader version and the current firmware version.

4 Click "update firmware", select the file with the firmware update (*.sbin).

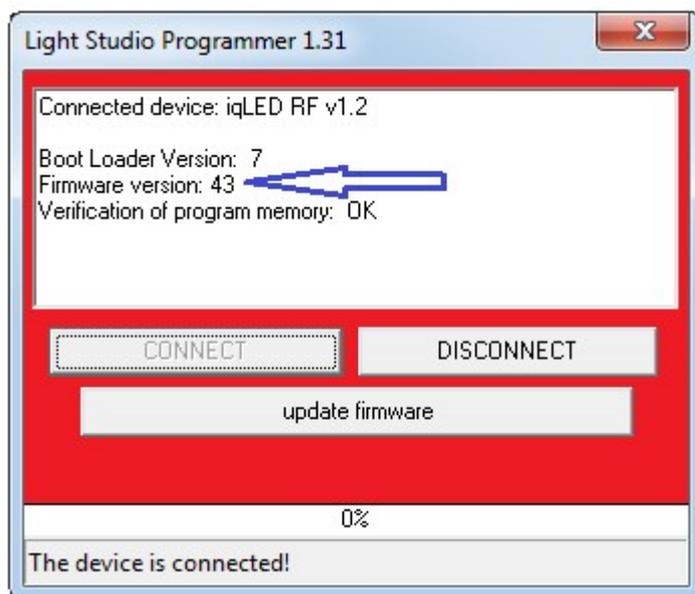
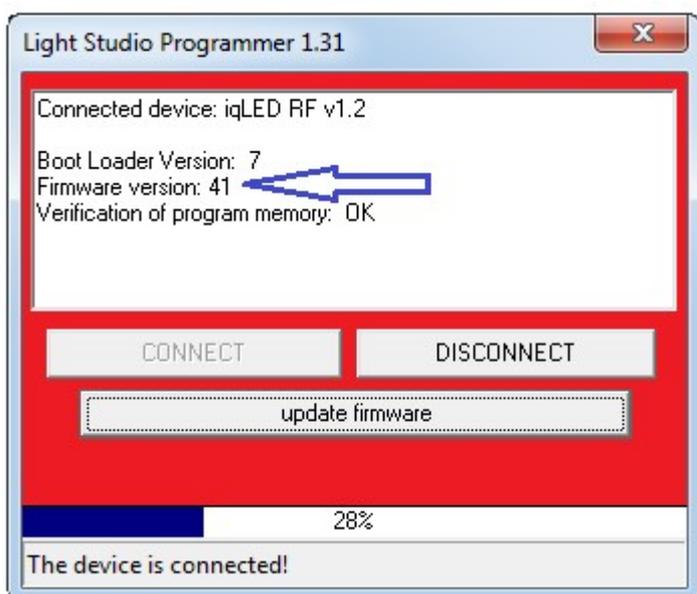
Download the firmware file from the official site.



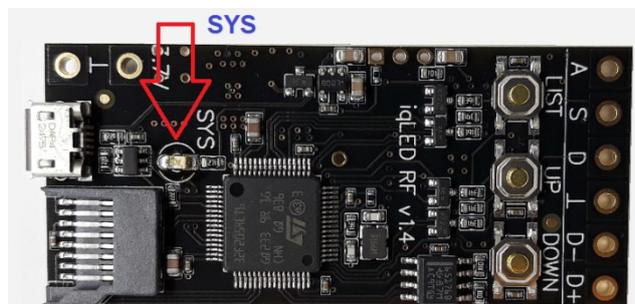


Next, click the "Open" button. An update process will start.

After updating, press the CONNECT button and make sure that the new firmware is installed successfully.



Indication of controller operation modes



1) Operating mode in Master configuration. It is activated when there is an SD card in the slot with a set of configuration files (Mode.txt) and animation files (*.led). The system indicator should produce double flashes with a period of 1 second.

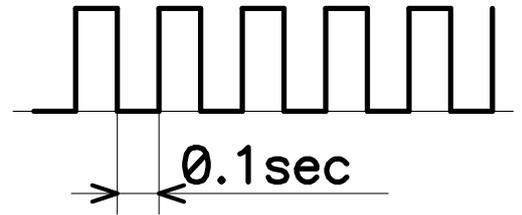


2) Operating mode in Slave configuration. It is activated when there is an SD card in the slot with a set of configuration files (Mode.txt) and animation files *.led.

The system indicator should make a state change from "on" to "off" through each received synchronization command from the Master on the radio. If the FPS is 30, the Master controller will send 15 synchronization packages per second, and as a result, if it is sure to receive, the controller's Slave system indicator will change state 15 times per second.

3) Firmware update mode. It is activated by holding the UP or DOWN button before connecting to USB.

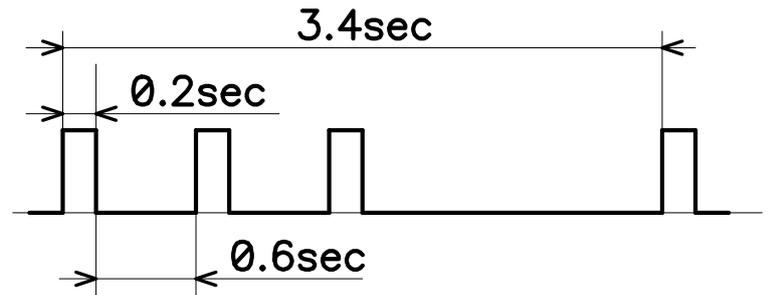
The system indicator should produce a state change every 0.1 sec.



4) Card reader mode.

It is activated by holding the LIST button before connecting to USB.

The system indicator should produce triple flashes with a period of 3.4 sec.



Recommendations

Do not place the antenna with the other conductors in a common cable, this significantly reduces the range of radio transmission and reception.

Use an external case or box to protect the elements of the controller from external mechanical impact and moisture.

Caution!

Static electricity!

Remember that electrostatic electricity can damage electronics. The main danger comes from the person carrying the charge. When mounting the LED strip and controller, always connect the GND line first. Do not switch the device to hot. Only the USB connector can be switched in the operating mode of the controller. In the winter season (with very low humidity) electrostatic electricity is especially dangerous.

Electric shock and fire safety!

It is not allowed to connect faulty power supplies to the device. Observe electrical and fire safety requirements. Do not leave a working device unattended for a long time. Keep children away from contact with the device.

Synchronization of LED animation with music

For the synchronous performance of LED animation with music, the following scheme is used:



One of the iqLED RF 1.x controllers is designated as the “Master” and is connected to the computer via a USB cable. On the computer the animation with sound is played using Media Player Classic Home Cinema (MPC-HC). The MPC-HC player transmits the time code to the “Master” controller, after which it is broadcast on the radio for the “Slave” controllers. This scheme allows to use all the options of MPC-HC, that is pausing, switching between tracks, WEB interface for connecting a smartphone, etc. For more information, refer to the “**Communication with Media Player Classic Home Cinema**” guide.

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