



RS485 wireless adapter with WiFi ESP-01 module

The wireless [adapter](#) removes the RS485 cables and provides the interface between RS485 and WiFi ESP-01 module.

It is known, in a RS485 net, the communication between master and slaves is half duplex. Master sends the command which is addressed to a particular slave. All the slaves are receiving the command, but the answer is returned only by the slave to whom the RS485 command is addressed.

The usual solution for RS485 wireless communication is based on the radio transmitter, receiver at 433 MHz. These devices are bulky and expensive, see [link](#).

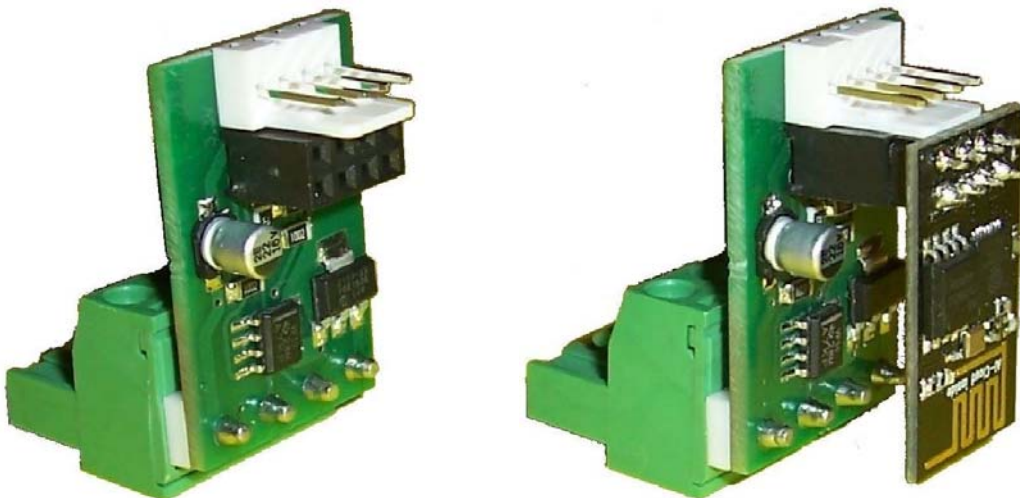
Our solution is based on the WiFi ESP-01 module, using ESP8266.

The first advantage is a longer communication distance of the 2.4GHz WiFi connection comparing to a 433 MHz transmitter, at the same power.

The ESP-01 master module is providing its own [Access Point](#) to which all the ESP-01 slaves modules permanently connect.

The RS485 communication is unchanged done over the WiFi Internet connection, protocol UDP.

The ESP-01 master module is broadcasting the RS485 command to all IP addresses in its wireless LAN. The command is executed and the answer is returned only by the ESP-01 module of the slave with the specified RS485 address.



Note 1: The RS485 wireless communication is using its own WiFi connection to [Access Point](#) and is independently working without any WiFi router.

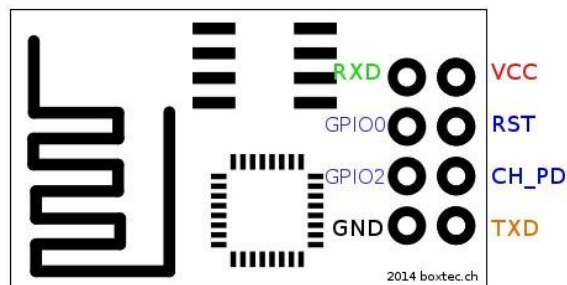
Other advantages:

- The price is lower than the price of the replaced RS485 cable.
- The labour is null, e.g. holes and cables in the walls etc.
- Star configuration.
- Low power consumption, typical 3,3~5V / 80mA.

The wireless adapter has three connectors, as presented below.

The black connector → connect WiFi ESP-01 module

The black connector has 8 pins for the ESP-01 connection.



The wireless adapter is pursuing the ESP-01 requirements:

- Supply voltage 3,3V, current 80mA.
- UART signals (Tx and Rx), logical level 0~3,3V, provided by RS485.

Arduino Programs

We have done two Arduino programmes:

- [rs485_master](#), used only by RS485 master.
- [rs485_slave](#), used by all RS485 slaves.

```
rs485_master | Arduino 1.6.10 Hourly Build 2016/06/06 08:34
File Edit Sketch Tools Help
rs485_master $
#include <ESP8266WiFi.h>
#include <WiFiUdp.h>

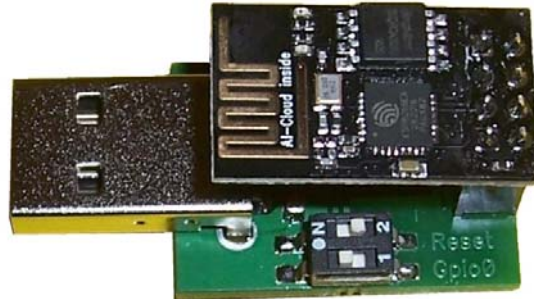
#define BAUDRATE          19200  //rata de baud a comunicatiei RS485
#define RS485_ENABLE_PIN  0      //pinul GPIO0

//parametrii pentru Access Point -> acesti parametri trebuie sa fie cunoscuti si de sclavi
char ssid[] = "myNetwork";      // your network SSID (name)
char pass[] = "myPassword";     // your network password -> min 8 caractere
```

The RS485 communication's [baudrate](#) setup is **mandatory** in the both programmes. The [ssid](#) and [pass](#) changes are **optionaly** in the both programmes.

No other changes are needed. The [Enable](#) signal is provided by the [GPIO0](#) pin.

The ESP-01 flashing programme is done using our USB - UART [converter](#) 3.3V, or another method.



The green connector → RS485 interface and power supply

The green connector has 4 pins. The middle pins **A+** and **B-** belongs to the RS485 interface and are clearly marked on the printed circuit.

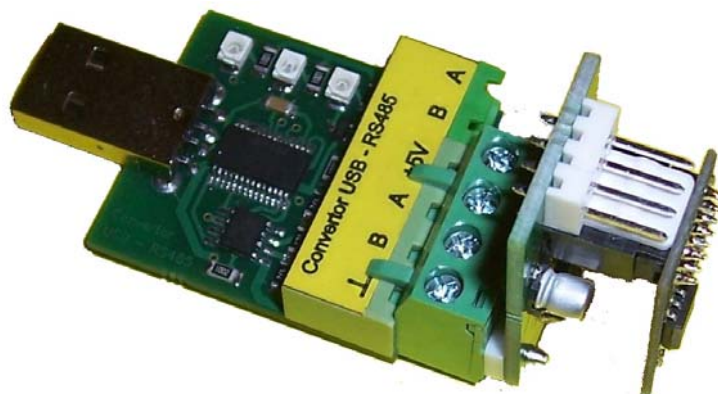
The lateral pins **Gnd** and **Vcc** get the power supply.

Note 2: The wireless adapter is realised in two variants, depending of the supply voltage: 5Vcc, respectively 5~12Vcc, according to our electronic [sketches](#). When the voltage supply is 3.3V, a simple strap over the internal power supply is solving the problem.

In many cases, the power supply is provided by the RS485 master and slaves devices.

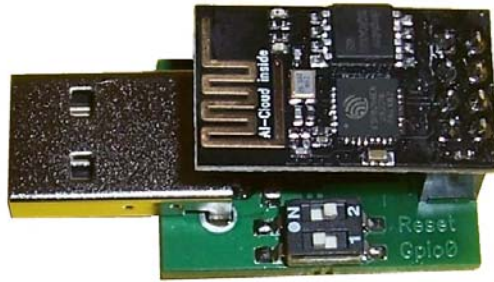
Connecting to RS485 master

Case 1: When RS485 master is a PC installed application, e.g. Modbus [interface](#) master PC, the wireless adapter connects to the USB - RS485 [converter](#):



The USB port of the PC provides trouble-free the necessary 5Vcc energy.

Note 3: In this particular case, the USB-UART converter 3.3V eliminates the double UART-RS485 conversion and provides the same aim.

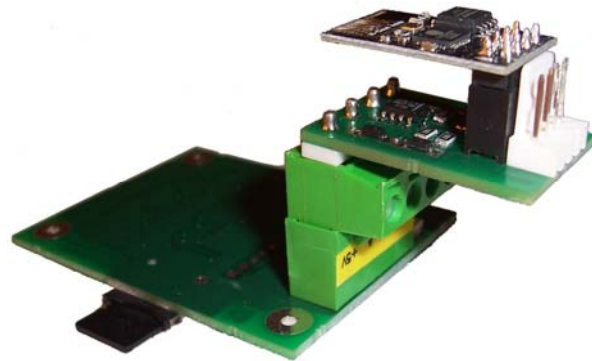
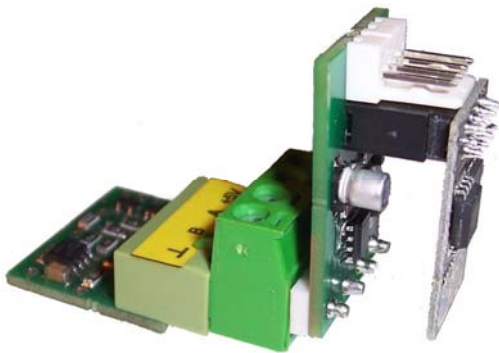


Case 2: When RS485 master is [Mini PLC4404](#), there are used:

UART - RS485 [converter](#)

or

[Data acquisition](#) in micro SD card



Case 3: When RS485 master is another PLC, controller etc, the procedure is as shown in the next chapter.

Connecting to RS485 slaves

The RS485 slaves are sensors or various other devices.

The adapter's power supply directly provided by the RS485 slaves is requiring a case by case analysis.

In the air quality AQ-01 [sensor](#) case, the visual analysis of the circuit looks like it has a 5V / 0.5A switch mode power supply.

The experiments have shown that the internal power supply is able to trouble-free supply the RS485 wireless adapter. The pair connector is necessary to be properly wired:

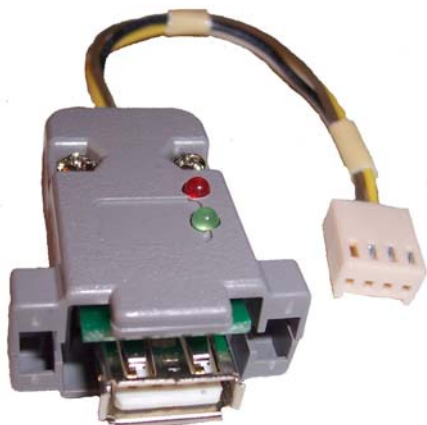


The white connector → auxiliary job

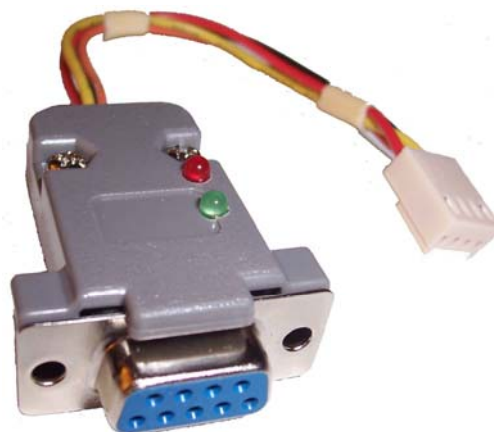
The white connector has 4 pins and is used temporarily only to debug programs, when developing new applications.

For this purpose there are used in reading [devices](#) serial traffic:

Read USB traffic



Read RS232 traffic



Note 4: The wireless adapter 5Vcc version can use the both reading devices.
The 3.3Vcc or 5~12Vcc adapter's version can use only the USB reading device.

Electronics sketches

