ESPWRC2 Programming on PWRC2 v10a using ESP-Conv1

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1. INTRODUCCION

This document describes the PWRC2 (CL2bm1-based) connection, from Firmware v10a, with ESP-Converter (ESP-Conv1) for Web access, additionally to conventional cabled RS232 access. The software running on the ESP-Conv1 is known as ESPWRC2. Testing is based on various updates performed in November 2021 on PWRC2 unit INTI #233 illustrated in Figure 1.

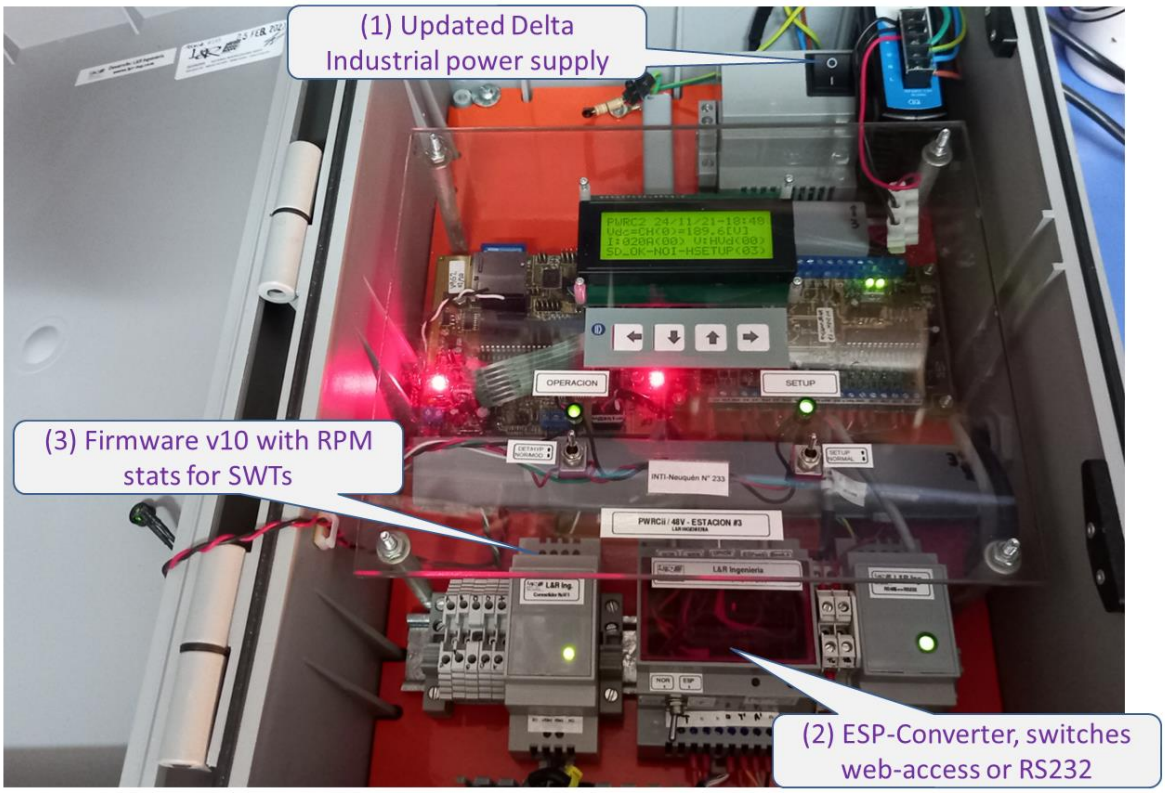

Figure 1 – PWRC2 #233 with updated (1) Delta power supply / Filters (2) ESP-Converter (3) RPM Stats on Firmware

2. ESP CONVERTER (ESP-Conv1) for Web interface

A web/Wi-Fi interface was added to the unit as an alternative to normal operation through RS232/ Ethernet converter. Using the manual switches on the ESP-Conv1, the prior normal mode can be easily restored.

2.1 Block Diagram and Operational Modes of ESP-Conv1: The new addition to CL2-based [ref1] PWRC2 Small Wind Turbine (SWT) measurement units is called ESP-Conv1. A block diagram and connection can be seen in Figures 2a,2b. It allows operators to use the existing RS232 interface on PWRC2 units in the conventional cabled terminal/ RS232 (bypass) directed to the CL2 board on the PWRC2 **(Mode1)**, to the WiFi / ESP12 (ESP8266) [ref3] module via its internal serial port (for ESPWRC2 Webserver software update) **(Mode2),** or redirecting this ESP internal serial port to the serial port on the CL2 board **(Mode3**). In this last mode, the PWRC2 can be accessed via WiFi using the integrated ESP12. Table 1 shows a listing of these operational modes.

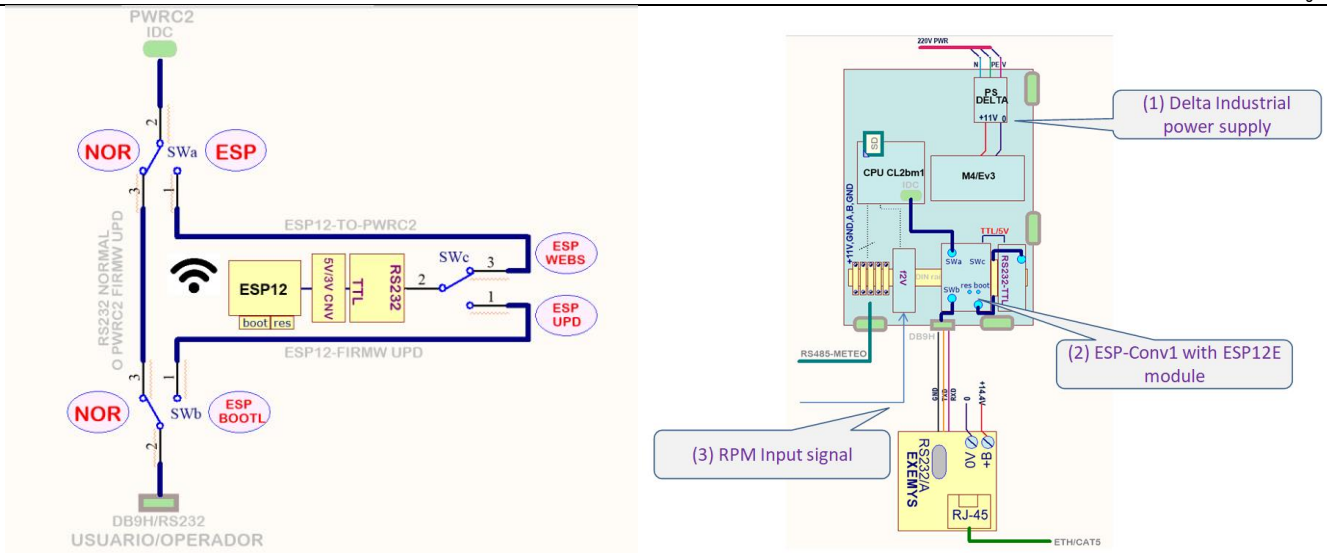

Figure 2a –ESP-Conv1 block diagram and connection to PWRC2

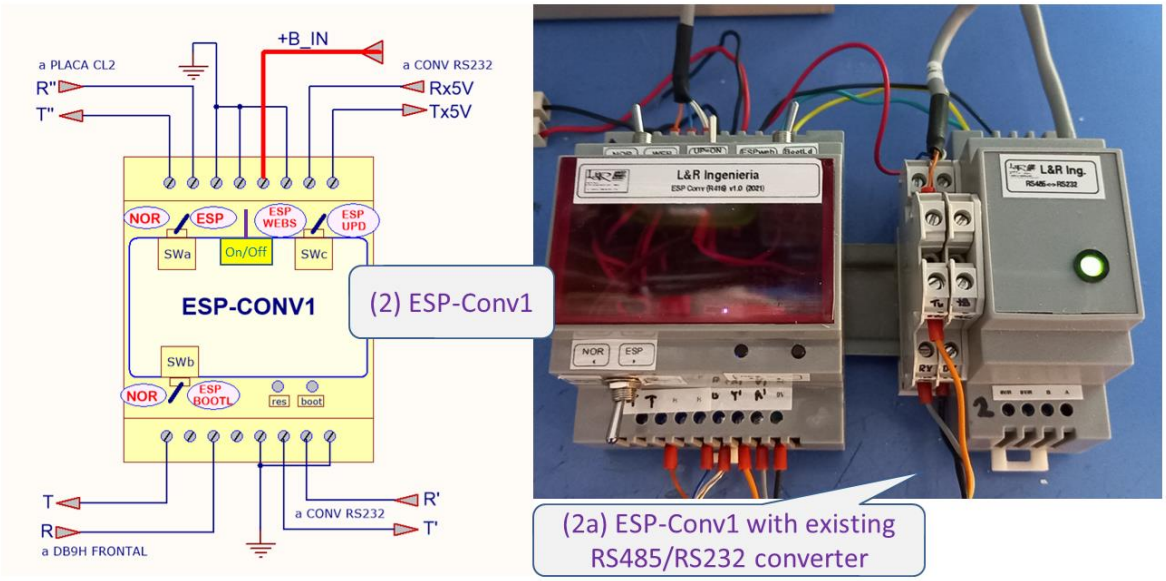

Figure 2b – Detailed ESP-Conv1 switch position and testing for PWRC2 connection

TABLE 1 – ESP-CONV1 OPERATION MODES

MODE	SWa	SWb	SWc	OBS
1	NOR	NOR	X	NORMAL/CABLED OR PWRC2 FIRMWARE UPDATE
2	X	ESP/BOOTL	ESP/UPD	UPD ESP12 FIRMW
3	ESP	X	ESP/WEBS	USER CONNECT to PWRC2 VIA WIFI

2.2 Mode 3 WiFi – user Access to PWRC2 via ESP-Conv1: This mode allows emulation of a cabled connection through WiFi . Table 2 and Figure 3 show switch positions for SWa / SWc. SWb is not used.

Mode 3 connection of PWRC2 to user vía WiFi - ESP-Conv1

MODE	SWa	SWb	SWc	OBS
3	ESP	X	ESP/WEBS	USER CONNECT to PWRC2 VIA WIFI

Table 2 – Mode 3 Switches on ESP-Conv1

In Mode 3 the operator can access PWRC2 via WiFi once the Access credentials are set using a conventional browser (e.g.Chrome) through the `espwrc2.local` page as shown in Figure 4.

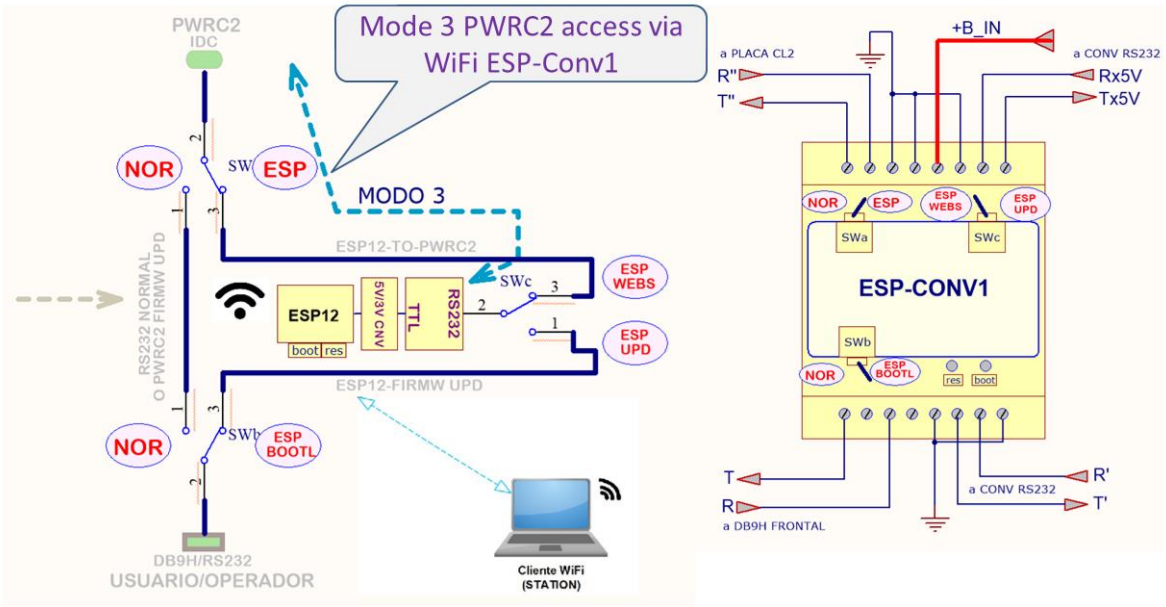

Figura 3 – Mode 3 – WiFi access to PWRC2 vía ESP-Conv1

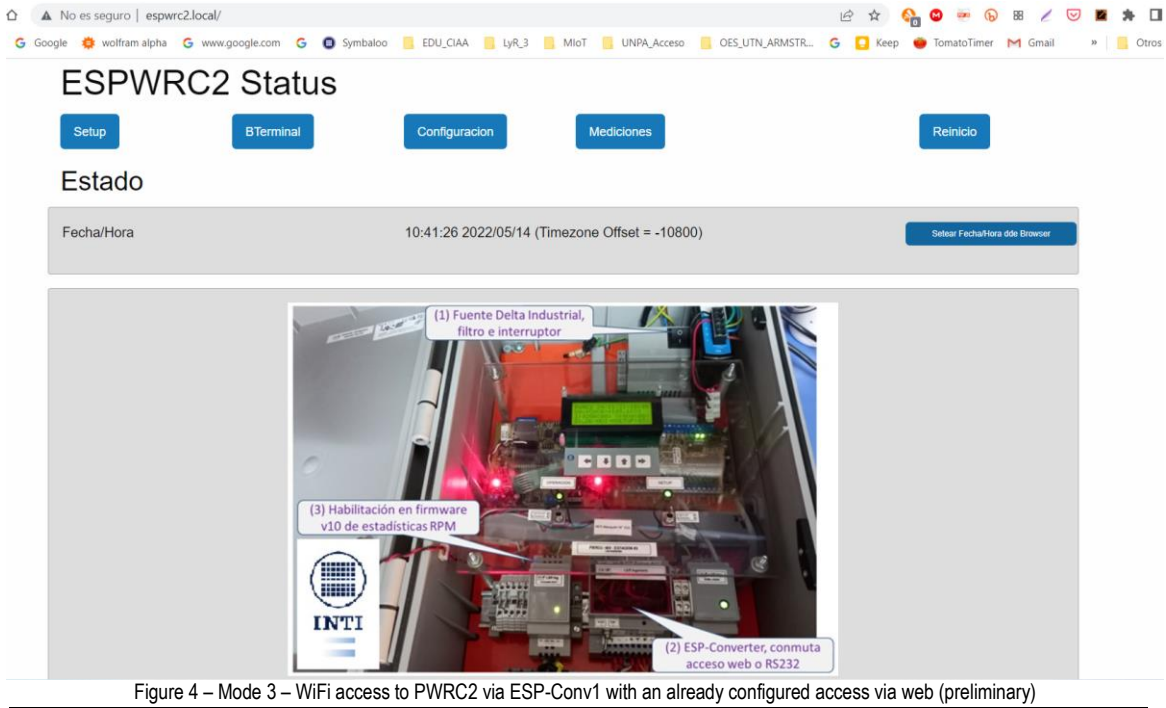

Figure 4 – Mode 3 – WiFi access to PWRC2 via ESP-Conv1 with an already configured access via web (preliminary)

2.3 Description of the terminal Function using ESP-Conv1: The terminal can be accessed from the following address: http://espwrc2.local/term.html. If the Mode3 access is set and the PWRC2 in Setup/Terminal mode (both switches up), the PWRC2 main menu can be accessed, as shown in Figure 5.

Figura 5 – Mode 3 in terminal access

3. Mode2 – Firmware Update of ESP: In Mode 2 (Figures 6, 7), the PC can be connected to modify the internal firmware and web-access data (HTML, CSS, Javascript files) on the ESP-12, via RS232 and a USB to serial converter. The example code can be downloaded from [ref2] repository. Once initialized from Visual Studio Code, with the PlatformIO plug-in installed [ref4], the Build File system (stored in /data directory) and Upload File System commands in the PIO menu must be executed. The upload requires the RES and BOOT button to be pressed and released in sequence. A screen similar to Figure 6 should appear.

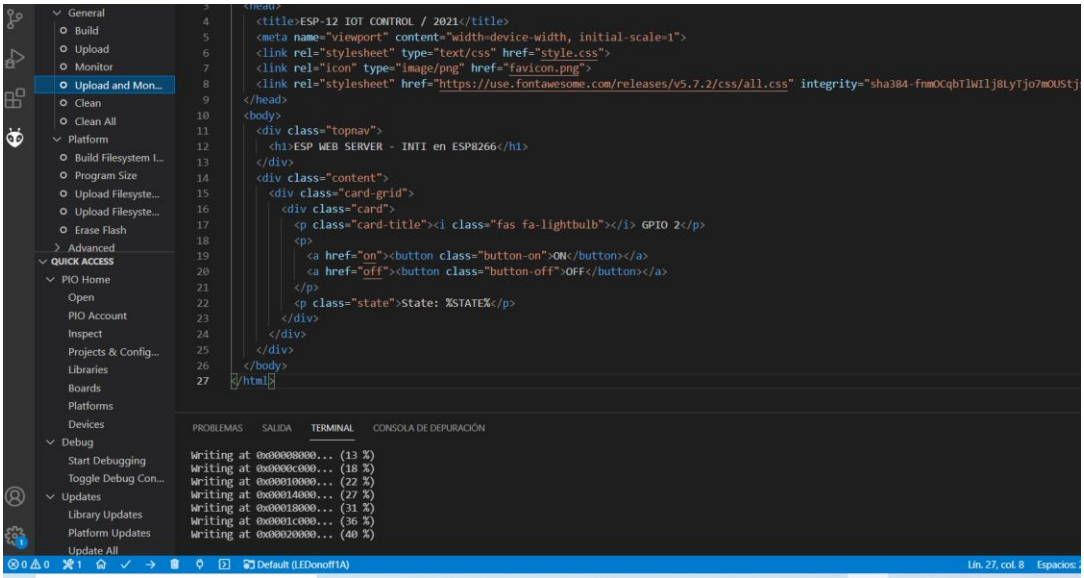

Figura 6 – Updating Firmware or FileSystem from VSC/PIO in Mode 2 to ESP-Conv1

After the Filesystem image is uploaded, Upload and Monitor executes the firmware build (in C++) and updates the ESP12 internal program memory, using similar front-button sequence as before, as shown in Figure 7. The ESP then starts the internal web server assigning an IP address and the naming via DHCP.

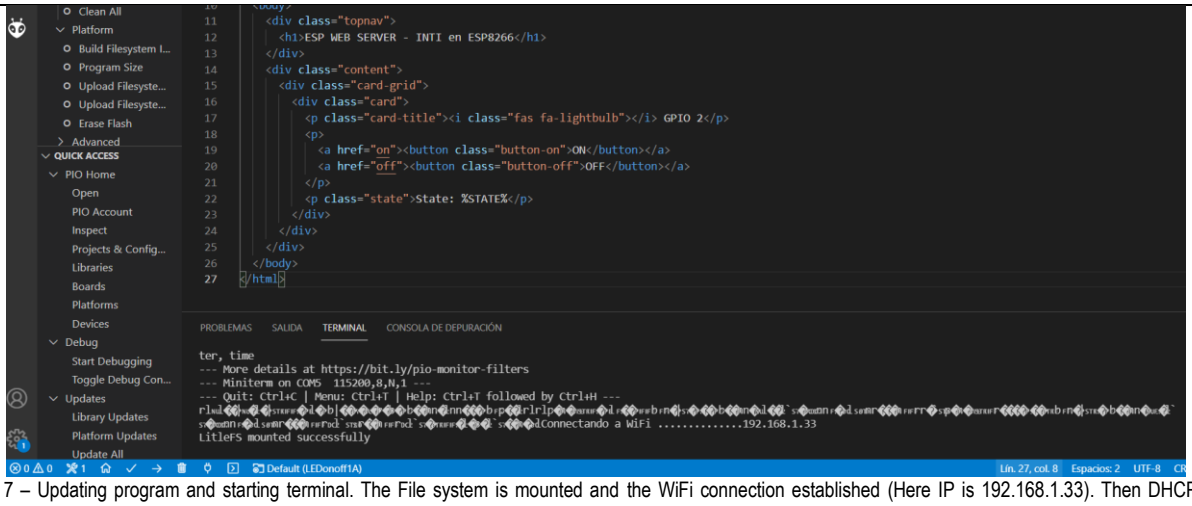

Figure 7 – Updating program and starting terminal. The File system is mounted and the WiFi connection established (Here IP is 192.168.1.33). Then DHCP assigns the naming of the ESPWRC2 server.

5. References

[Ref1] CL2b board and interfaces: https://www.lyr-ing.com/Embedded/LyRAVR_CyEn.htm
[Ref2] ESPWRC2 internal firmware: https://github.com/LyRIng/ESPWRC2v2
[Ref3] ESP12/ESP8266 by Espressif: https://www.espressif.com/en/products/modules/esp8266
[Ref4] Visual Studio Code https://code.visualstudio.com/

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NOTES: