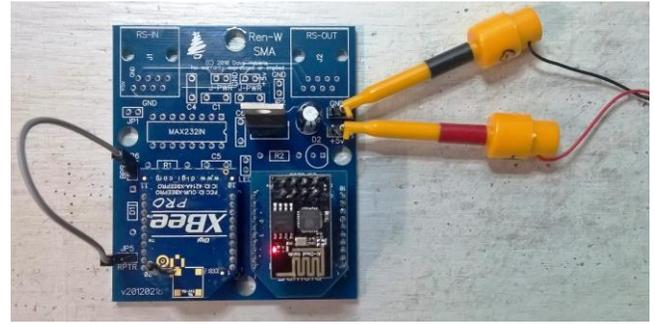


# Control your XBee Network via your Wi-Fi Network



## Overview

Using only a few parts from DIGWDF, you can control your XBee-based controllers via your home Wi-Fi system. This guide assumes that the end user already knows the basics of setting up XBee radios, flashing and configuring ESP modules and configuring his/her sequencing software to output control commands to the Wi-Fi network. All of these issues are already addressed elsewhere or in the diychristmas.org forum.

## BOM – Bill of Materials

Quantity	Description	Part #	Source
1	DIGWDF Ren-W SMA PCB	Ren-W SMA	DIGWDF
1	DIGWDF ESP Snap-in PCB	ESP Snap-In	DIGWDF
1	3.3v voltage regulator, 500ma minimum	UA78M33CKCS	Mouser.com
1	100uf, 10 or 25v electrolytic capacitor		TaydaElectronics.com
4	2-pin male headers (or 1, 40-pin breakapart header)		TaydaElectronics.com
4	XBee female header mounts (For SMA board)		eBay
2	XBee male header mounts (for ESP Snap-In)		eBay
1	2x4 pin female header (for ESP Snap-In)		eBay
1	Short connect wire (2 to 4 inch, Dupont or other type)		eBay
1	ESP-01 module		eBay, Aliexpress, etc.
1	XBee radio module		User supplied
1	5vdc, 1A minimum power supply (cell phone charge type)		User supplied

A kit containing all parts (except the XBee radio and power supply) is available from the DIGWDF Store.

## Assembly

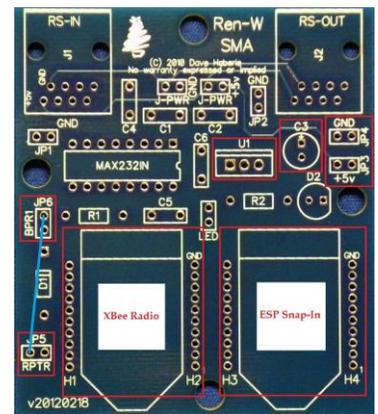
### 1. SMA PCB

- Install and solder the four XBee female header mounts onto the SMA PCB at locations H1, H2, H3 and H4.
- Install and solder the four, 2-pin headers on the SMA PCB at JP3, JP4, JP5 and JP6.
- Install and solder the 100uf electrolytic capacitor at C3 on the SMA PCB. This is a polarized part; be sure to solder the + side to the PCB marked +.
- Install and solder the 3.3v regulator at the U1 position on the SMA PCB. This is a slightly heat-sensitive part so don't over-solder it.
- Of course, clip off excess leads from the board after installation.

### 2. ESP Snap-In PCB

- Install and solder the two, XBee male headers onto the bottom side of the Snap-In PCB. Suggestion: Solder one hole first and check for straight vertical alignment before soldering all the pins.
- Solder the 2x4 pin female header onto the TOP of the Snap-In PCB.
- Solder across the two circuit connector pins for the version of ESP software you will use: either the GPIO2 pins (Shelby Merrick's version) or TX pins (Bill Porter's original version).

- Plug the completed ESP Snap-In into the RIGHT (RX) side of the SMA PCB.
- Plug the ESP-01 module into the ESP Snap-In PCB.
- Plug your XBee radio into the LEFT (TX) side of the SMA PCB. This radio must be pre-configured to transmit to your XBee receivers.
- Attach the short connection wire between the TOP pin of the JP6 header to the outside (left) pin of the JP5 header.
- Check all solder joints to ensure there are no shorts and unsoldered pins.
- Assembly is complete.



## Configuration Highlights

- Set the sequencer's E131 plugin to the universe you want to use for your XBee network. This should only cover the XBee network: additional show channels must be handled with a separate universe ID.
- Set the E131 plugin to use the same channels that have been used for XBee before. In other words, if you had channels 1-272 channels in your XBee network, set the E131 plugin for the same 272 channels in the universe. (The maximum is 286, which is the maximum a single XBee network can accommodate at 57600 baud).
- Set the ESP module into Renard serial mode at 57600 baud.
- Set the ESP module to the same universe number and size (i.e. 272 channels in this example).
- Set the ESP module's start channel to 1 (to correlate to channel 1 in your sequencer)
- The XBee radio must be set to the recommended 57600 baud for Renard control. XBees cannot be used in a DMX environment because of this speed limitation.

With the above configuration, channels 1-272 (in this example) should be a 1:1 match and the Wi-Fi and XBee networks should be in sync.

If you have more than one XBee network, configure an additional universe for EACH XBee network and assign the corresponding channels to it. Remember, the maximum number of channels for an XBee network is 286 because of the 57600 baud rate limitation.

## Troubleshooting

### No reception by the XBee controllers

- Check voltage across pins 1-10 of the XBee transmitting radio: you should have 3.3vdc or very close to it.
- The power supply may not be providing enough current. 1A minimum at 5vdc is required.
- The short connection cable on the SMA PCB is bad or plugged into the wrong pins: check it for continuity.
- The universe assignments or channel assignments don't match
- The XBee channels aren't assigned to the E131 plugin
- The ESP module is not configured in Renard serial mode.
- The ESP module is not configured at all or not online (check it via browser)
- The controllers are not powered on

### Can't connect to the ESP module

- Check your network settings, perhaps reflash the ESP module. Almost all of these issues are outside the scope of this guide.

### Magic smoke emanates from the SMA PCB

- Unplug the PCB from power; check the power supply's voltage output. The UA78M33CKCS regulator can accommodate voltages up to 35vdc although it will get increasingly hotter as the input voltage rises above 5vdc.
- The power supply's outputs are reversed when connected to the SMA. Note the + and G terminals!
- This is an everyday event at DIGWDF and it's not necessarily bad... the DIGWDF engineers sometimes cook lunch over projects that have caught fire... turn lemons into lemonade!!!

## Questions & Answers

- **“I’m seeing a slight lag in performance.”** Yes, this is possible. Remember, your Wi-Fi access point is sending data to the ESP module, the ESP is receiving/decoding that information and transferring it to the XBee module so that the XBee can re-transmit it to the XBee receivers; a few milliseconds may be required to get all this done at 57600 baud. While a delay should be rather minimal, for the perfectionist, it may result in a *slight*, visible delay in the lighting effect. If a consistent delay is noticed, one solution is to simply move all the XBee effects ahead in the sequence by perhaps one cell or 10ms to accommodate the delay. Easy peasy.

Another issue that can create a delay is whether your Wi-Fi network is also your Internet connection. This is generally a discouraged practice as either the show or the Internet connection or both will suffer in performance. The best option is to use separate networks for these applications.

- **“I can’t get it to work with my wireless router. Can you help me with my network?”** No. Both XBee communications and ESP communications have been amply addressed in the diychristmas.org and other forums. You’re on your own in that regard.
- **“I still can’t get it to work. Can you check it over?”** Yes, absolutely! DIGWDF offers a FREE, no-fail build guarantee and we’re always happy to check it over for you – and fix it if something’s not right. Just send it to us and be sure to include adequate return postage so we can send it back to you. Some folks don’t include the return postage and after we fix the problem, we just put it in a box on the shelf until the owner complains, *“Where’s my board – did you fix it yet?”* Note also that we can’t solve your XBee or ESP issues because those are specific to your installation, and we can’t reproduce that environment. So don’t include the XBee or ESP modules, or your wireless access point, etc.
- **“I don’t know how to solder. Can you make one for me?”** No, sorry. We provide bare circuit boards and easy-to-assemble kits and we’re not in the business of manufacturing finished products. Learning to solder is easy – you can even pick up an expensive soldering practice kit at the DIGWDF Store.
- **“I want to use a BlueTooth module instead. Can I do that?”** Interesting idea, but you’ll have to roll that one on your own. You may be able to make an adapter to fit on the SMA board for your BlueTooth module. Let us know how it works out for you. We have no interest in experimenting with the BlueTooth platform.