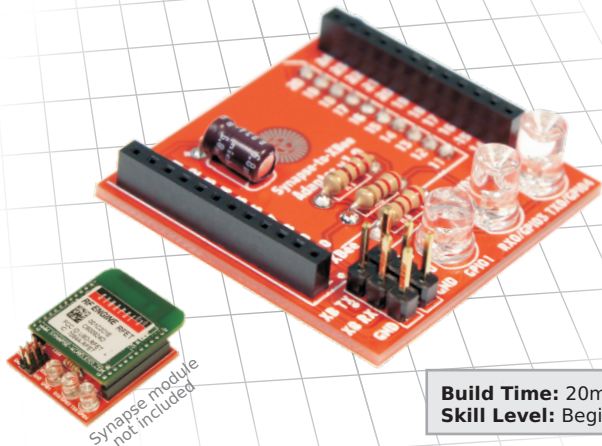


# Synapse-Xbee Adapter Kit

Ever want to change the species of your RF modules? Upgrade your XBee-footprint devices to the more feature-rich Synapse series of 2.4GHz radios!



**Build Time:** 20mins  
**Skill Level:** Beginner (2/5)

- Drop-in XBee replacement
- Second UART access

- Tx/Rx/GPIO indicators
- Open Source Hardware



 **SOLARBOTICS**® Ltd

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## Introduction:

The XBee series of 2.4GHz modules are very cool, but the Synapse series trumps them with a second UART, I2C, extra I/O, and even PWM. And they use embedded Python! This adapter board lets a **Synapse 802.15.4 RF Module** act as a drop-in replacement for a 10-pin XBee module application. The pin mapping is designed for best device-to-device matching with the exception of power, UART, reset, and the reserved pins.

There are 2 breakout headers on this board:

The 3-pin header P1 includes breakout pins XB TX & XB RX, which are for the main UART communication lines that are used by both the XBee and Synapse Modules. These pins are attached to the following:

- **XB TX** (Data Out): Xbee Pin 2 (DOUT) pins to Synapse Pin 10 (GPIO8\_TX\_UART1)
  - **XB RX** (Data In): Xbee Pin 3 (DIN/!CONFIG) to Synapse Pin 9 (GPIO7\_RX\_UART1)
  - **GND:** Connection to the negative reference of power
- The 3-pin header P2 includes breakout pins TX0 & RX0, which are for the other UART port that the Synapse Module has (UART0). These pins are attached to the following:
- **Tx0** (Data Out): Synapse Pin 6 (GPIO4\_TX\_UART0)
  - **Rx0** (Data In): Synapse Pin 5 (GPIO3\_RX\_UART0)
  - **GND:** Connection to the negative reference of power.

This design is release under the Open Source Hardware Definition v1.0

## Disclaimer of Liability & other Legalese

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# Parts & Materials List

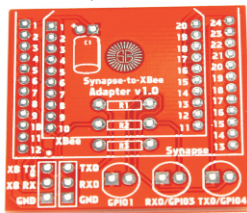
6.8µF  
Electrolytic  
capacitor



5mm  
Super  
bright  
LEDs



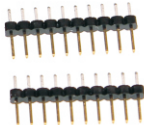
Adapter PCB



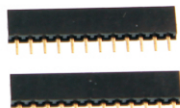
3-pin 0.1"  
Male headers



10-pin  
2mm  
Male  
headers



220 ohm resistors



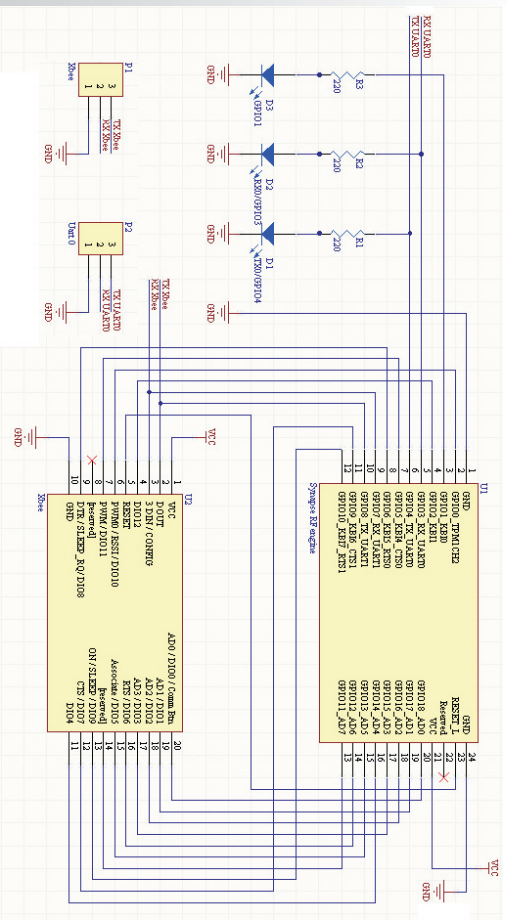
12-pin 2mm  
Female headers

## Tools & Materials Needed:

- Soldering supplies
- Safety glasses
- Side cutters
- Masking tape (optional)

QTY	Part	Designators
3	5mm LED (1 each of red, green, orange)	GPIO1, GPIO3, GPIO4
3	220 Ohm resistor (red red brown)	R1, R2, R3
2	12-pin 2.0mm Spacing female header	
2	10-pin 2.0mm Spacing male header	
2	Synapse-Xbee Adapter PCB	
1	6.8uF 35V Electrolytic cap	C1
1	3-pin 0.1" Spacing male header	

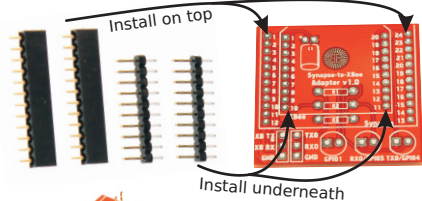
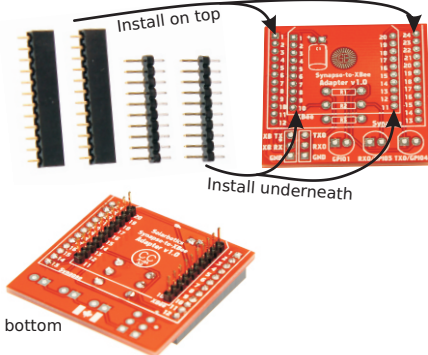
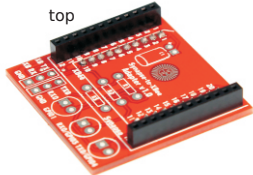
# Circuit Diagram



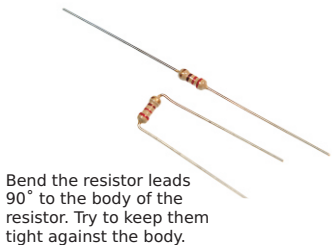
# Construction

**1. Pins / Headers:** Take your Synapse-Xbee Adapter PCB and solder on the 10-pin male header pins on the side with the Solarbotics Logo.

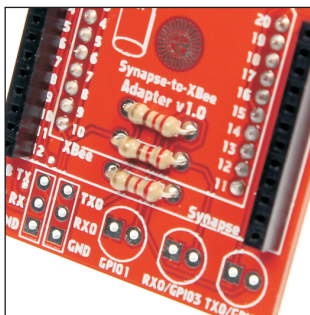
If necessary, use some tape to hold the pins in place while you solder.



**2. Resistors:** Bend the 220 ohm resistor leads tight against the resistor body and install in the R1, R2, & R3 positions. Solder and trim!

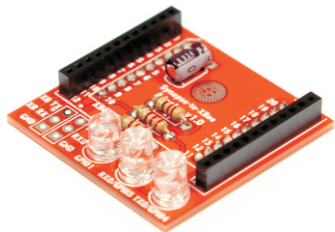
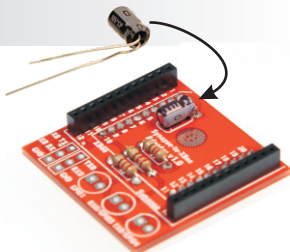


Installed and soldered!



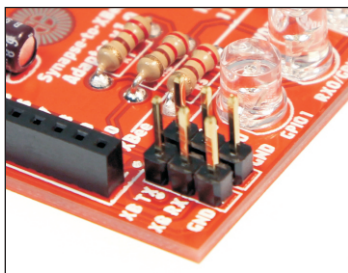
## Construction

**3. Capacitor:** Bend the leads on the 6.8 $\mu$ F electrolytic capacitor to the *left* of the negative symbol on the cap. Install it flat, at 'C1', matching the orientation pictured on the board markings (also observing polarity) and solder it in place. It must lay flat to avoid the Synapse module to be installed above it.



**4. LEDs:** Time for Rx / Tx / GPIO LED indicators. We prefer to use Green for TX0, Red for RX0, and Orange for GPIO1. If your LEDs are clear, color-test them with a coin cell battery, or take your chances! Just remember to match the shape, or put the shorter lead through the *square* pad. Install, solder and clip!

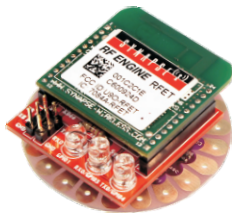
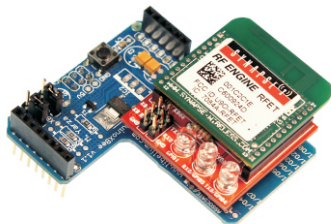
**5. Communication Header:** We broke out both the UART1 (XBee UART) and UART0 (Synapse Spare) to this pair of headers for easy comms hacking. Install the two 3-pin headers here, then solder, and trim! You're done!



## Applications

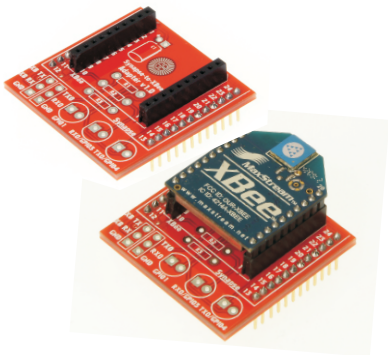
If you already have Xbee hardware, like the Xbee Shield by Arduino, you can use your Arduino board to program the synapse module through the Xbee Shield (remove the Arduino IC, and set jumpers to USB).

You can use a Synapse module with the Lilypad as a longer range drop-in replacement for an Xbee. Use this application for e-textile projects where wireless controls/readings are needed, or you can use the Synapse module to control and communicate with other modules sewn onto other costumes and/or garments.



### Here's a nifty trick:

You can always go the other way if you'd like to adapt an Xbee module to a board designed for Synapse modules. Just add a set of 12 male headers and 10-pin female headers (both 2mm spacing) to an unpopulated Synapse-Xbee Adapter PCB, and you can then use Xbee modules on Synapse boards.



## Technical Support

Technical support is available if you are having problems - please contact us and provide as much detailed information as possible.

**E-mail:** support@solarbotics.com

## Related Items

**Solarbotics Synapse-to-FTDI  
Adapter** SKU# 39250



**Synapse Max Range Mesh  
with RP-SMA Connector**  
SKU# 51750



**Synapse Max Range Mesh  
with RP-SMA Connector**  
SKU# 51762



**Synapse Max Range Mesh  
with Integrated Antenna**  
SKU# 51752



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