BRUCONTROL

Process Automation Made Personal

Application Note

Building a Two Channel Fermentation Controller with a Sonoff Dual Wireless Smart Switch.

Updated: February 7, 2018

There are a few off the shelf wireless switches on the market which are based upon the ESP8266/8285 microcontrollers, which BruControl supports. This creates an advantage for the system builders who are less-experienced, lack the time or desire to build a fermentation controller, or have budget constraints. One such series of switches are the Sonoff models (https://www.itead.cc/smart-home.html). BruControl has been tested to work with the TH10/TH16 and Dual models. The Dual is interesting in that it contains two 10A relays, spring terminals, and internal pinouts which can be leveraged wo wire a 1-wire temperature sensor. Assuming the user has the basic tools and kit items, this controller build should cost less than $45.

Component List Components:
1. 1x Sonoff Dual Wireless Switch, Version R2: http://a.co/4ae6kif
2. 2x 10-foot, 14 AWG Power Extension Cords: http://a.co/dXd5VvK (or equivalent).
3. 1x 2M Waterproof Digital Temperature Sensor Probe (DS18B20): http://a.co/h8uDEsA (this kit includes 5. Or equivalent).
4. 8x Female Pin Jumper Wires http://a.co/gvLn2Pp (this kit includes 40. 2 needed for assembly, 5 needed for programming. Or equivalent).
5. 1x 4-pin Single Row, 2.54mm Pitch Straight Connector Header: http://a.co/brRI3eQ (this kit includes 600 pins. Or equivalent).
6. 1x 4.7k resistor: http://a.co/2kSnUDd (this kit includes 10. Or equivalent).
7. USB to TTL Serial Interface Adapter (for programming): http://a.co/fJU6SqU (or equivalent).
8. Nylon ties, heat shrink tubing, small Philips screwdriver, soldering iron, solder.

Assembly Instructions:
1. Open the Sonoff Dual by first removing the terminal cover screw, then carefully prying the case open by separating the bottom plate from the main case body.


2. Unscrew the 4 screws mounting the circuit board to the bottom plate. Be careful to avoid discharging static electricity into the circuit board by grounding yourself first.

3. Break a piece of single row header into a 4-pin section. Solder the 4-pin header into the open holes in the upper left corner of the Sonoff circuit board. This will be called the "new header" below.'

4. Inspect the CPU chip on the underside of the circuit board. If it does not read ESP8285, contact BruControl technical support via email address on website.
5. Re-install the circuit board to the bottom plate with the original four screws.
6. Install Female Pin Jumpers as follows:

Button 0 (existing header)	GND (existing header)
GND (new header)	GND (serial adapter)
Vcc (new header)	Vcc (serial adapter)
Tx (new header)	RXD (serial adapter)
Rx (new header)	TXD (serial adapter)
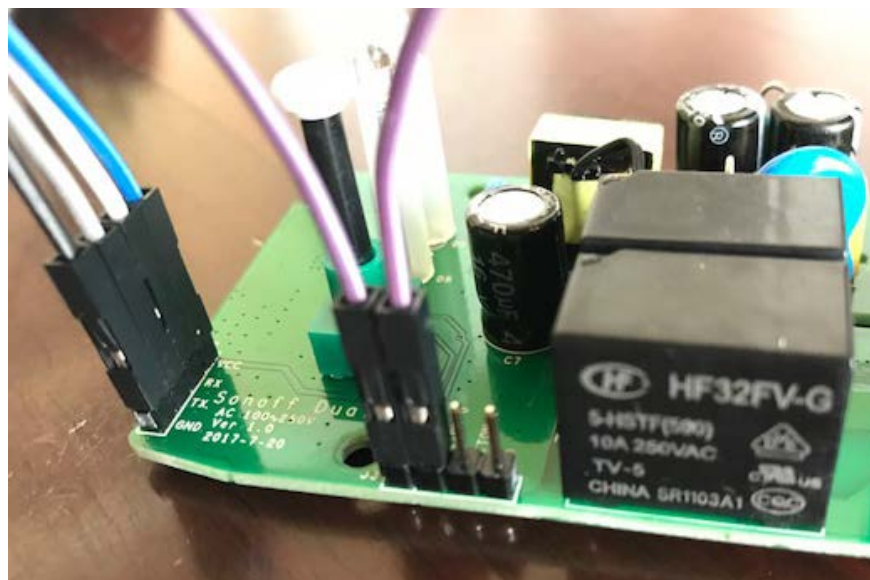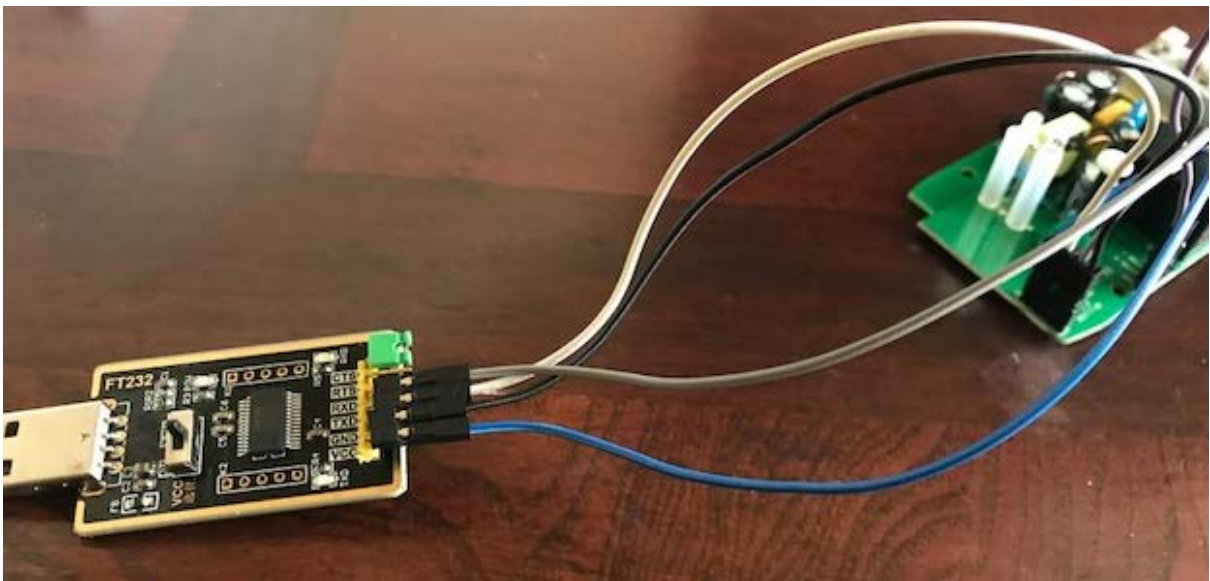
7. Plug the Serial Adapter/Sonoff assembly into a computer serial port (USB).
8. Run BruControl Universal Interface Firmware Tool, "InterfaceSetup.bat". Perform the Firmware Installation step first, selecting the Sonoff Firmware and installing per the prompts. Ensure the firmware was uploaded successfully.
9. Proceed to the Network Setup step, following the prompts to enter the terminal mode. Enter "%0&15;" into the terminal and press Enter. The BruControl network setup prompts will appear. Press "y" and Enter to begin setup. Follow steps in BruControl User Manual for network & Wi-Fi troubleshooting.
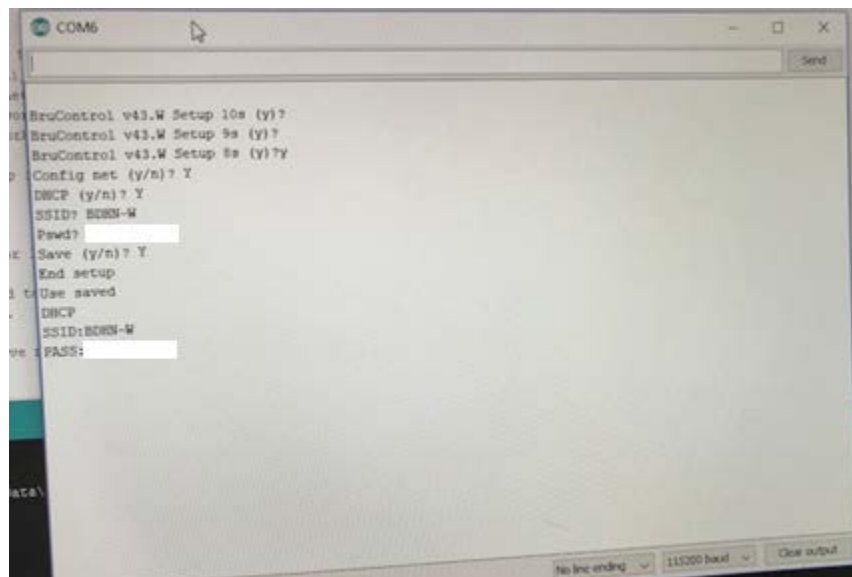
10. Once completed, remove the Serial Adapter/Sonoff assembly from the computer USB port. Remove all the jumper wires from the Sonoff Circuit board.

11. Cut the three remaining jumpers (ideally colors black, red, and yellow), leaving about 1"
    of wire off the female connector. Strip the wires about ¼" long.

12. Pass the Temperature Probe wire through the hole in the side of the Sonoff main case.
13. Solder the black jumper wire to the black wire of the Temperature Probe. Seal with heat
    shrink tubing.
14. Solder the red jumper wire to the red wire of the Temperature Probe. Solder one side of
    the resistor to the connection as well. Seal this connection with heat shrink tubing.
15. Solder the yellow jumper wire to the yellow wire of the Temperature Probe. Solder the
    other side of the resistor to the connection as well. Seal this connection with heat shrink
    tubing.

16. Plug the female connector with the black wire to the GND pin of the new header. Plug the female connector with the red wire to the VCC pin of the new header. Plug the female connector with the yellow wire to the BUTTON 1 of the existing header.

17. Retract the Temperature Probe wire through the main case body hole until there is just enough slack once the main case body is installed back on the bottom plate. Loop a nylon tie inside the case around the Temperature Probe wire and pull it tight to create a strain relief inside the case. Trim the tie's loose end. Alternatively, use a larger piece of heat-shrink tubing to create a larger diameter wire which cannot retract back out of the hole any further.

18. Reassemble the main case body onto the bottom plate. Make sure the Temperature Probe wires are not impacted, pulled, etc. Note: The existing header resides just behind

the hole in the side of the Sonoff main case, therefore it may be more desirable to drill another hole elsewhere in the case.

19. Cut both extension cords, leaving 9' of plug end and 1' of receptacle end. Save one of the 9' plug ends for another project. Note: If preferred, 16 AWG receptacle cords may be used, so long at the plug receptacle is 14 AWG.

20. Strip about 1" of the PVC jacket insulation off each of the 3 remaining extension cord pieces (2 receptacles and 1 plug end). Strip about ¼" of insulation off the black and white wires. Strip about ½" of insulation off the green wires.

21. To insert wires into the Sonoff's terminals, press the terminal button down all the way, insert the wire fully, then release the button. Ensure the wire is appropriately inserted and seated by tugging on the wire. Insert the plug cord's black wire into the "L In" terminal. Insert the plug cord's white wire into one of the "N" terminals. Insert both receptacle cords' white wires into the remaining "N" terminals. Insert one each of the receptacle cords' black wires into the "L Out 1" and "L Out 2" terminals, respectively.'

22. Solder the three cords' green wires together, and seal with heat shrink.

23. Re-install the terminal cover, being careful not to damage any of the wiring.

24. Plug the power cord into a 120V, 15A GFCI protected outlet. Plug devices of choice into each receptacle cord, ensuring that neither device draws more than 10A individually or 15A in aggregate.

25. Create the interface and respective devices in BruControl. The relays which feed each receptacle are on Ports 5 and 12. If controlling heating/cooling of a fermentation or dispensing system, these should be Hysteresis devices. The Temperature Probe can be any port 200 – 209, so long as the sensor index is zero, since it is the only temperature probe attached. Subsequent temperature probes if wired in (see note below), will need subsequent indexes.

Note: Multiple Temperature Probes can be installed if desired. All black, red, and yellow wires should be wired in parallel. Multiple devices can be read through different sensor indexes.