How to build the Wi-Fi remote for Bestway Lay-Z-Spa

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1) Checking compatibility

Table of models (not exhaustive)

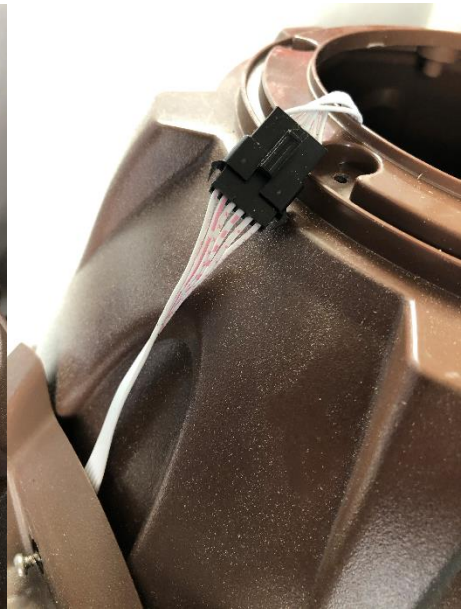
Alias	Model Number	Pump specs	Wires	Supported
Riviera	12220	Eggshape	?	?
Monaco	54113	Eggshape	?	?
Vegas	54122	Eggshape	6	?
Miami	54123	Eggshape	6	Yes
Palm Springs	54129	Eggshape	4	?
Hawaii/Hydrojet	54138	Square	4	Yes*
Palm Springs/Hydrojet	54144	Square	?	?
Paris	54148	Eggshape	?	?
Hawaii	54154	Eggshape	6	Yes
Siena	54156	Eggshape	4	?
2019 Maldives/Hydrojets	54173	Square	4	Yes*
Honolulu	54174	Eggshape	*6*	?
St. Moritz	54175	Eggshape	6	Yes
Bali	54183	Eggshape	?	?
Milan	54184	Eggshape	?	?
Tahiti	54186	Eggshape	6	Yes
Helsinki	54189	Eggshape	6	Yes
Cancun	54286	Eggshape	?	?
Ibiza	54291	Eggshape	?	?
Havana	54298	Eggshape	?	?
2021 Miami		Square 2021	6	Yes**
2021 Bali		Square 2021	6	Yes**
2021 Maldives/Hydrojets		Square 2021	6	Yes**
Vegas	54112	?	4	
Coleman SaluSpa	13804 ?	Eggshape	6	Yes
St. Lucia	S100101	Square 2021	6	Yes
SaluSpa Honolulu	S100104	Square 2021	6	Yes

*Some 4-wire models are reported to get communication error messages. Possibly due to brownouts caused by weak power supply. A 47-100 uF capacitor between 5V and GND may help.

** Might need 560 Ohms resistors between LLC and display (CLK, DATA, CS), as reported by cyberfly79

Open the pump to verify number of wires

Unscrew the 6 screws as the picture shows, and carefully lift the display. It is attached with a cable with a connector on it. Check if there are 6 or 4 wires/pins. Other models can be disassembled in a similar manner. On the older Hydrojets you must remove the whole cover, not the display. That pump is heavy and fiddlier to disassemble on your own.

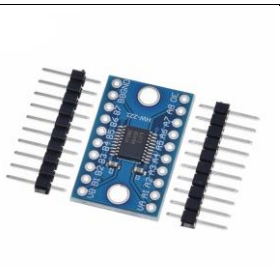
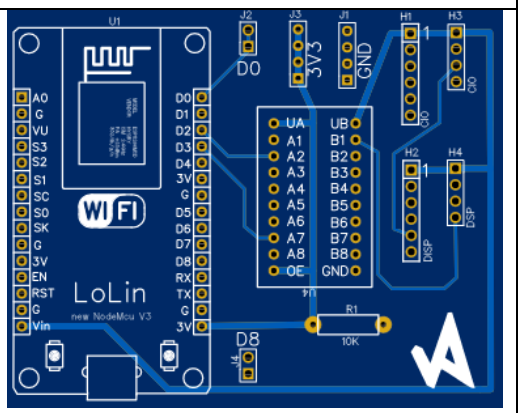


Example – eggshaped 6-wire pump

2021 square model

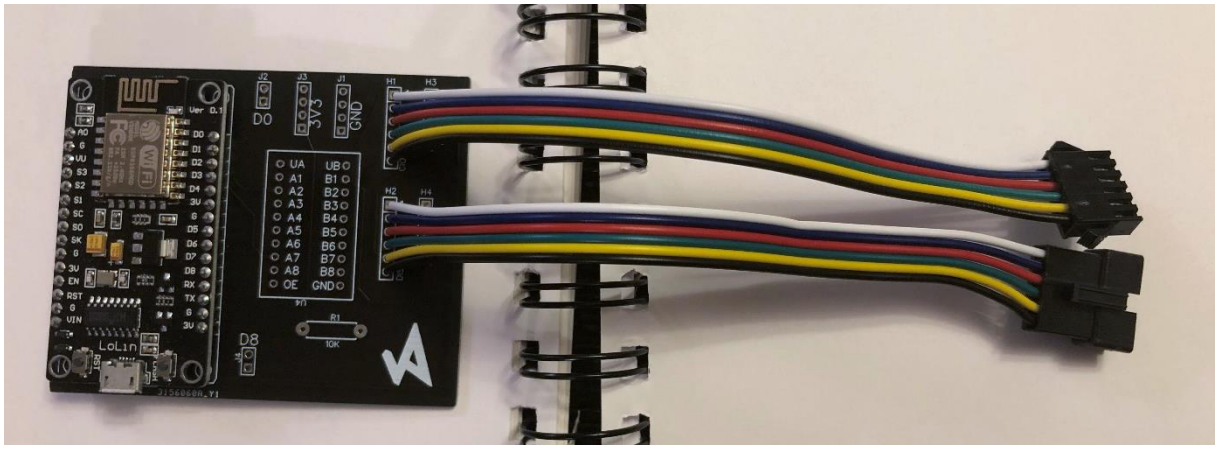
2) Hardware

BOM

ESP8266 NodeMCU 1.0 (12E) V3 (wider than V2) (NOT ESP32)	
8 channel bidirectional level converter TXS0108E	
6 or 4 pin male/female pair cable 0.1" spacing: JST SM Housing Connector www.wish.com	
PCB https://oshwlab.com/Visualapproach/bestway-wifi-controller To order, scroll down to the PCB layout, click open in editor. Then go to Fabrication/download gerber files. *(I don't get % on your order. You pay same $ as I did)*	
Resistor, 10K Ohms, throughhole (Optional for power-on stability. I run without it and it works fine.)	Optional
Female header pins (0.1") to solder to the PCB for the ESP and LLC to be removable.	Optional but highly recommended

Build

Solder the 6-wire cables to the PCB (H1, H2):



For the 4-wire version, use the 4-wire cables and solder to the two 4-holes section (H3, H4).

Pinout (Colors and pinout on your pump may differ!):

1 (Uppermost. Black on pump)	= 5V
2 (Red on pump)	= GND
3 (Yellow on pump)	= DSP TX
4 (Green on pump)	= CIO TX

Solder the 10 K resistor.

You can go on and solder the LLC and ESP8266 directly to the PCB, but I recommend using female headers. In case you want to switch or reuse them.

D0, D8, 3V3 and GND is left empty. They are there for the possibility to connect auxiliary equipment.

Put the PCB in a box, plastic bag or something to protect against water if you want.

Don't connect the connectors to the pump yet.

3) Software

6-wire and 4-wire versions

DL and install Visual studio code: https://code.visualstudio.com/download

From within VSC, click on Extensions icon (ctrl+shift+X). Select PlatformIO IDE and install.

From the new platformio icon, open folder "6-wire-version" or "4-wire-version".

*If you have a year 2021 model you need to edit the file "**BWC_8266_globals.h**" from:*

```
//uncomment your model and comment out the rest
#define PRE2021          //the older one, no hydrojets
//#define MIAMI2021      //no hydrojets
//#define MALDIVES2021   //hydrojets
```

To:

```
//uncomment your model and comment out the rest
//#define PRE2021            //the older one, no hydrojets
#define MIAMI2021        //no hydrojets
//#define MALDIVES2021   //hydrojets
```

Or:

```
//uncomment your model and comment out the rest
//#define PRE2021            //the older one, no hydrojets
//#define MIAMI2021      //no hydrojets
#define MALDIVES2021     //hydrojets
```

Upload sketch via USB*. (Right arrow at bottom of screen)

Upload LittleFS Data or you will get a 404! Click platformio icon, go to PROJECT TASKS > nodemcuv2 > Platform and build filesystem image, then upload filesystem image.

An Access Point is created called "Auto portal". Log in and enter your wifi credentials. Visit IP/ and click "Go to config page" Enter your settings, click SAVE. The device's IP is shown in the serial monitor window (only 6-wire) and the pump display (only 6-wire).

From now on you can update the device over the air (OTA) by editing platformio.ini file.

* Make sure the last four rows in platformio.ini file is commented out like below, or it will try to upload over the air, which is not possible until after the first upload over USB.

```
[env:nodemcuv2]
platform = espressif8266@^2
board = nodemcuv2
framework = arduino
lib_deps =
    bblanchon/ArduinoJson@^6.17.2
    mcxiaoke/ESPDateTime@^0.2.0
    links2004/WebSockets@^2.3.3
    knolleary/PubSubClient@^2.8
    tzapu/WiFiManager@^0.16
board_build.filesystem = littlefs
monitor_speed = 115200
;Uncomment the lines below, by removing semicolons, and edit IP for OTA upload
;You have to upload via USB cable the first time. Make sure to use a data-
USB cable. There is power only cables that wont work.
; upload_protocol = espota
; upload_port = 192.168.4.121
; upload_flags =
;   --auth=esp8266
```

Old Arduino instructions.

You can still use Arduino IDE if you like, but you have to rename "main.cpp" to the parent folder's name.ino and move the lib/BWC files to the same folder.

Arduino IDE https://www.arduino.cc/

LittleFS upload tool

From Arduino library manager, install

ArduinoJSON (Benoit Blanchon)

ESPDateTime https://github.com/mcxiaoke/ESPDateTime

WebSockets https://github.com/Links2004/arduinoWebSockets

WiFiManager https://github.com/tzapu/WiFiManager

LittleFS https://arduino-esp8266.readthedocs.io/en/latest/filesystem.html#uploading-files-to-file-system

And for MQTT sketch also

PubSubClient https://github.com/knolleary/pubsubclient

Select the right board (NodeMCU12E), and set "FS 2MB/OTA 1MB", speed 80 MHz. select correct COM port.

OTA:

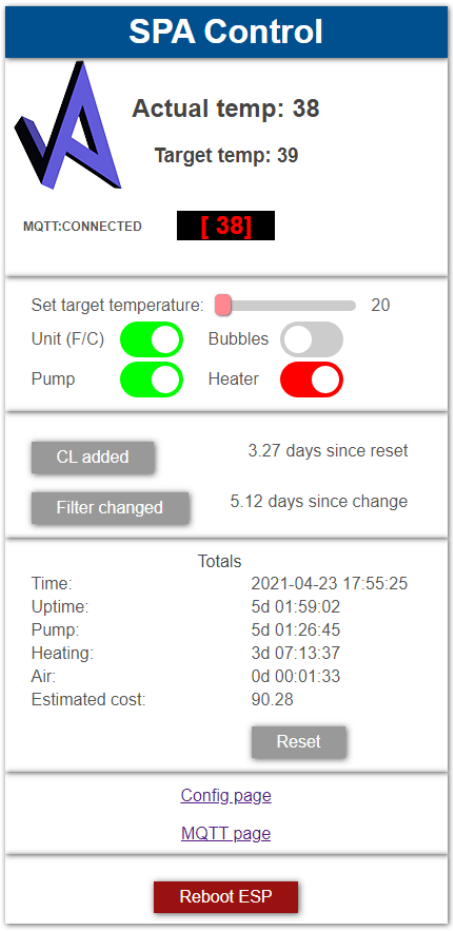
Password "esp8266"

selecting the new IP instead of the COM port. You need to restart Arduino IDE for this to show up.

If it does not work – use platformio or google

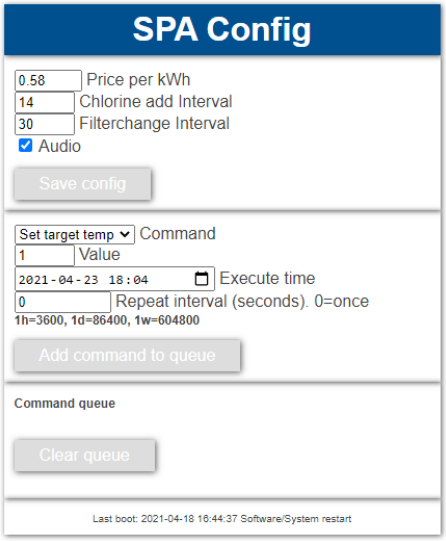
4) Web interface

Main page (/index.html)



Main page shows information about the spa, like temperature, and elapsed time since last filter change, chlorine added and how long the pump has been running etc. Press [CL added] or [Filter changed] to reset the timer. These buttons will turn red when overdue. Pressing the [Reset] button will reset the Totals times.

[Reboot ESP] restarts the ESP 8266. Just in case you want to hear that lovely melody and read the greeting on the display again.

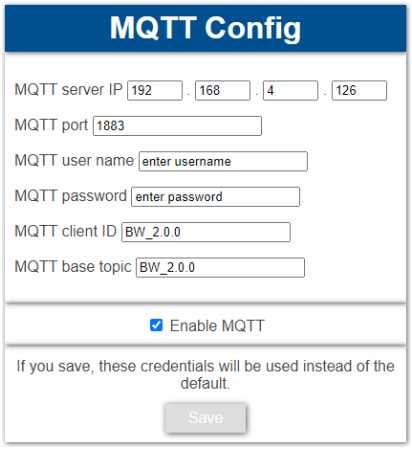


On the config page you can set

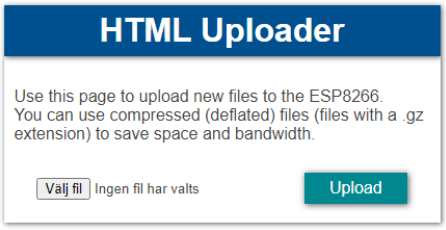
- your electricity price (so main page can guesstimate your bill)
- how often you want to add chlorine or switch filter.
- if you want the display to be playing tones or be silent (only 6-wire)
- start up behaviour after power outage. (default OFF, or last state)

In the next section you can add commands to the command queue. For instance you could set target temp to 20 on Sunday evenings, and 40 on Thursday mornings. After a couple of seconds, the added command will show up in the queue. Max queue length is 10.

MQTT page



Secret upload page (/upload.html)



Use this to upload updated files like index.html etc

Other pages available on 6-wire version

/resetwifi/

/remove.html

/dir/

5) Connect

Unplug pump from mains! Connect device to pump. Close the display with the screws. Turn on pump and enjoy.

6) MQTT

This chapter is for advanced users. If you know what MQTT is, and have an MQTT broker, this is what you need to know:

There is two ways to enter your credentials. You can edit the "credentials.h" file before compiling and then you are done with it. Or you can go to the web interface and click on the MQTT link. If you save from the MQTT web page it will override credentials.h.

Device is publishing following topics:

BW_2.0.0/status

BW_2.0.0/MAC_Address

BW_2.0.0/MQTT_Connect_Count

BW_2.0.0/message

BW_2.0.0/button

Device is subscribing to topic **BW_2.0.0/command**

Payload in **message** is a JSON string with these key/value pairs:

KEY	VALUE
LCK	LOCKEDSTATE
PWR	POWERSTATE
UNT	UNITSTATE (0=F, 1=C)
AIR	BUBBLESSTATE
GRN	HEATGRNSTATE
RED	HEATREDSTATE
FLT	PUMPSTATE
TGT	TARGET TEMP
TMP	TEMPERATURE
CH1	CHAR1 DISPLAY'S FIRST CHARACTER
CH2	CHAR2
CH3	CHAR3

Payload in **command** must be a JSON string with these key/value pairs:

KEY	VALUE
CMD	INTEGER, see next table
VALUE	MIXED
XTIME	Execution time in UNIX TIMESTAMP or 0 for immediate action
INTERVAL	Repeat every Nth second INTEGER or 0 for NO REPEAT

Available commands (CMD) are

0	SETTARGET
1	SETUNIT
2	SETBUBBLES
3	SETHEATER
4	SETPUMP
5	RESETQ (clear command queue)
6	REBOOTESP
7	GETTARGET (internal use)
8	RESETTIMES
9	RESETCLTIMER
10	RESETFTIMER
11	SETJETS (only some models)
12	TAKECONTROL (only 4-wire)

7) FAQ

https://github.com/visualapproach/WiFi-remote-for-Bestway-Lay-Z-SPA/discussions

If you like this project, please consider a donation: PayPal.me/TLandahl