WLED PVC PIPE LAMP – BILL OF MATERIALS

- 4-inch Frosted Acrylic Tube of desired length (this is the main lamp shade) https://www.amazon.com/gp/aw/d/B093PF2WRT?psc=1&ref=ppx_pop_mob_b_asin_title
- 5M WS2812 LED strip 60/meter 300 LEDs, as many as needed (5 meters covers roughly 11 inches of 2 inch pipe lamp core in a spiral wrap) - https://www.amazon.com/gp/aw/d/B088FJF9XD?psc=1&ref=ppx_pop_mob_b_asin_title&th=1
- ESP8266 D1 Mini - https://www.amazon.com/gp/aw/d/B08FQYZX37?ref=ppx_pt2_mob_b_prod_image
- Level Shifter (if needed, depends on controller and LED strip, you may have to experiment) - https://www.amazon.com/your-orders/pop?ref=ppx_yo2dv_mob_b_pop__np_1_pp&orderId=113-6604912-2502624&lineItemId=nljgltpqppnrony&shipmentId=Tx5RdtbwQ&packageId=1&asin=B09JVXKHJK
- Pushbutton - https://www.amazon.com/American-Standard-Microswitch-Atomic-Market/dp/B074WF11MJ/ref=mp_s_a_1_16?crid=NNFEHKHSZJH7&keywords=28mm+arcade+push+button&qid=1649604863&sprefix=28mm+arcade+pushbutton%2Caps%2C227&sr=8-16
- Power Jack Pigtail - https://www.amazon.com/43x2pcs-Connectors-Security-Lighting-MILAPEAK/dp/B072BXB2Y8/ref=mp_s_a_1_4?crid=23N2CDD37B6U0&keywords=5.5mm+power+pigtail&qid=1649604979&sprefix=5.5mm+power+pgtail%2Caps%2C262&sr=8-4
- 5VDC 10A (or larger) power supply - https://www.amazon.com/BTF-LIGHTING-Plastic-Adapter-Transformer-WS2812B/dp/B01D8FM71S/ref=mp_s_a_1_1_sspa?crid=T212WS2LJOKZ&keywords=5v+10a+power+supply&qid=1649605096&sprefix=5V+10A%2Caps%2C316&sr=8-1-spons&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUEzUVVFRUU1SlhKM1JNJmVuY3J5cHRlZElkPUEwMjQ1MTI0QzU0QUpXTE9OTE1QJmVuY3J5cHRlZEFkSWQ9QTA3ODg1MjI0VllBMTdGQjZORjEmd2lkZ2V0TmFtZT1zcF9waG9uZV9zZWFyY2hfYXRmJmFjdGlvbj1jbGlja1JlZGlyZWN0JmRvTm90TG9nQ2xpY2s9dHJ1ZQ==
- 20 ga wire - https://www.amazon.com/Electronics-different-Insulated-Temperature-Resistance/dp/B07G2GLKMP/ref=mp_s_a_1_4?crid=NCBW5J6ICG12&keywords=20+ga+wire&qid=1649605166&sprefix=20+ga+wire%2Caps%2C217&sr=8-4
- 2 inch x 1-inch-less-than-frosted-acrylic-shade-length PVC or ABS pipe (this is the lamp core the LED strip is spiral wrapped around; drill to pass power and data wires inside the core) - https://www.amazon.com/PVC-Pipe-Sch-Inch-White/dp/B072Q9M54Z/ref=mp_s_a_1_3?crid=27SI2W3ZVEPMZ&keywords=pvc+pipe+2+inch+12+inch&qid=1649605277&sprefix=pvc+pipe+2+inch+12+inch%2Caps%2C258&sr=8-3

- 4inch DWV to FIP cleanout adapter - https://www.amazon.com/Canplas-193704AS-PVC-Cleanout-Adapter/dp/B00QPQCL4Q/ref=mp_s_a_1_1_sspa?crid=W0R10GLTQKMX&keywords=4+inch+cleanout+adapter&qid=1649605810&sprefix=4+inch+cleanout+adapter%2Caps%2C229&sr=8-1-spons&psc=1&smid=A3I07C5PD33KVE&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUFNRjFMRTFXUTRYWEImZW5jcnlwdGVkSWQ9QTA4ODE2MjYyQk1PTlBINU41TFQyJmVuY3J5cHRlZEFkSWQ9QTA1MDY2MjcxNE5RUjlJQjdLUTYmd2lkZ2V0TmFtZT1zcF9waG9uZV9zZWFyY2hfYXRmJmFjdGlvbj1jbGlja1JlZGlyZWN0JmRvTm90TG9nQ2xpY2s9dHJ1ZQ==
- 4 inch threaded cleanout plug or other means of securely blocking the DWV cleanout adapter to form base for lamp shade and mounting surface for electronics. NPT threaded plugs will require sanding and reduction of the threads to allow full insertion; this can be a long and difficult process. A thick PVC disc that can be cemented in is better. Remember to drill the plug or disc for mounting of the 2 inch PVC cap lamp core holder as more holes for wire passthrough.
- 2 inch PVC cap (for mounting the lamp core) - https://www.amazon.com/Fitting-Schedule-Furniture-Adapter-Fittings/dp/B09PTMSTMK/ref=mp_s_a_1_17?crid=2RN9RAVAYSNAP&keywords=2+inch+pvc+cap&qid=1649606034&sprefix=2+inch+pvc+cap%2Caps%2C236&sr=8-17
- 4 inch pvc cap (covers the top of the shade and the button) - https://www.amazon.com/SOLV-PLASTIC-TRENDS-MfrPartNo-P1604/dp/B000H5W1IC/ref=mp_s_a_1_3?crid=2Q01LW2E639W2&keywords=4+inch+pvc+cap&qid=1649606115&sprefix=4+inch+pvc+cap%2Caps%2C380&sr=8-3
- Mini 5A fuse holder (increase to 10A if more than 150 LEDs) - https://www.amazon.com/YUNPICAR-Fuse-Holder-Waterproof-ATM/dp/B09FPPVSG3/ref=mp_s_a_1_3?crid=1HR5XZLLBNDP0&keywords=mini+fuse+holder&qid=1650633964&sprefix=mini+fuse+%2Caps%2C241&sr=8-3

    - 12 volt rectifier or Zener diode (allows simultaneous USB and external power) - https://www.amazon.com/BOJACK-1N5349B-Power-Diodes-1N5349/dp/B07X7VJ7ZC/ref=mp_s_a_1_11?crid=2SEUYHCKNKNL6&keywords=25+volt+zener+diode&qid=1650636881&sprefix=25+volt+zener+diode%2Caps%2C217&sr=8-11
    - 100 Ohm resistor (for DIN GPIO)
    - 10K Ohm resistor (if needed for external pullup on button-to-board line)
    - 10K Ohm Potentiometer (if desired for “analog button” capability; see WLED site and tutorials for connection information)

Solderless Build

- Mini breadboard and DuPont jumpers and 18 ga *insulated* crimp connectors (for connection of power wires to LED strips)
- Automotive insulated connector crimpers

- Glue gun for fixing components and wire in place inside base

Soldered Build

- Stripboard or perfboard and heatshrink tubing
- Soldering tools, hair dryer or heat gun for heatshrink tubing

INSTRUCTABLE SHOWING ASSEMBLY IS IN PROGRESS!

ROUGH VERBAL INSTRUCTIONS

1. Key step is to create some sort of plate for installation in the 4-inch DWV adapter fitting which allows mounting of the 2 inch cap on the top and installation of electronics on the bottom. You can use a 4 inch cleanout plug, threaded in "upside-down", but because all NPT threads have taper, heavy sanding of the threads and reduction of the thread profile will be required to get the cleanout plug seated all the way into the fitting. This is not an easy process. Much easier is to just cut out a 4-inch circular plate approximately 3/16" (4-5mm) thick from PVC (or ABS if you are using an ABS DWV adapter) and then use standard pipe cement to mount it inside the fitting. *See next steps below before permanently mounting.*
2. Before permanently mounting the 4 inch plate in the DWV adapter fitting, drill the plate and a 2 inch cap so that the 2 inch cap can be mounted in the center of the plate. This is the base mount for the 2 inch pipe lamp core that will hold the LED strips. Mount the cap, then drill additional holes for wires to exit from the lamp core pipe into the base where the electronics will be mounted.
3. Permanently install the base plate into the DWV fitting using an appropriate cement. ABS is a preferred material for both fitting and plate since ABS has excellent bonding properties, but PVC will work as well. *Do not expect cyanoacrylate (super) glue to hold the plate in place with the lamp core installed.* Use a heavier cement, epoxy, and/or supplemental #2 round head or pan head screws (screws are not listed in the BOM)
4. Drill the bottom of the 4 inch fitting where the electronics will go to accept power wires/jacks, potentiometers, buttons, or any other devices you will be mounting to the base. If you are using a cleanout plug, for any through-mount parts, following installation of the plug you may need to cut it back to expose the wall of the 4 inch adapter fitting. This is not an issue if using a plate.
5. Temporarily install a spare 2" cap on the bottom of the lamp core pipe; do not cement this temporary cap. This provides spacing to position the start of the LED strip on the lamp core.
6. Drill a hole just above the cap large enough to accept connector and wires at the start of the LED strip
7. Assuring that the input side of the data in (DIN) LED strip is located at the bottom of the lamp core pipe, insert wires from the LED strip through the hole just drilled and then peeling adhesive backing as you go, spiral wrap the LED strip onto the 2-inch lamp core pipe. For a 12 inch lamp core, cut off any extra strip at the top. For longer core pipes, you'll need to add more LED strips. Do this by drilling

additional holes in the core pipe into which you can push connectors once plugged in. You can cut extra power wires, or crimp connectors onto them. Remember to crimp mating connectors with power leads long enough to reach the base and install these before pushing the lot through the hole. Then finish wrapping the strip. For cores 24 inches or longer, you will need to use or add power wires at the *top* of the lamp core pipe. Once again, drill a hole in the lamp core pipe for these wires to enter the inside of the core pipe and use crimp connectors to extend them down into the base.

8. Once you are done with spiral wrapping, you should be able to remove the 2 inch cap from the bottom and install it on the top. Adjust the LED strip length at the top of the core if needed to assure the 2 inch cap seats successfully. Remove the cap.
9. Drill the cap to fit your arcade pushbutton. Attach leads to the button long enough to reach the base. Make one of these black for connection to ground and the other a color other than red for connection to a GPIO pin. Push mount the button to the top of the core pipe, running the wires through the pipe to the bottom. Do not cement the 2 inch cap.
10. You should now have a lamp core consisting of a spiral wrapped LED strip on the outside of a 2 inch pipe of whatever length you've chosen, a cap and button friction mounted on the top, and then a whole mess of power and data wires coming out the bottom of the core pipe. *There should be no wires on the exterior of the core.* If there are, make corrections to the build as appropriate.
11. It is strongly recommended that you use a microcontroller flashed with a simple test program or a small smart LED strip controller to test the LED strip and wiring at this time before proceeding further with the build.
12. Carefully feed the bundle of wires from the lamp core through the hole(s) you drilled inside the 2 inch cap mounted to the 4 inch plate (which is in turn now mounted inside the 4-inch DWV adapter fitting.) Once the wires are fed through, pull them snug, then friction fit the lamp core into the 2 inch base cap. It is recommended to not cement the core to the base cap; this allows the core to be dismounted later for troubleshooting or correction of the LED wiring.
13. You should now have a 4 inch DWV fitting with an cleanout plug/base plate threaded or cemented into it, a 2 inch pipe cap on the top of that plate, the lamp core with spiral wrapped LED strip friction fit into the 2 inch mounting cap, and a second 2 inch mounting cap with pushbutton installed into it friction fit to the top of the core pipe.
14. You may want to flash your board prior to permanent installation of the electronics into the base.
15. Install the electronics into the base on the underside of the 4 inch plate/cleanout plug. If using a breadboard, use hot melt glue to secure DuPont jumpers in place. You may need to bend the jumpers over so they do not project beyond the bottom of the 4 inch fitting.
16. Moment of truth: apply power. Troubleshoot if needed. Once everything is working, you can install a perforated protective cover on the bottom of the lamp, along with stick-on or other small legs to keep the base elevated for air

circulation. (Do not seal up the electronics in the base! Assure that air can circulate to keep the electronics cool.).

17. Slide the lamp shade over the LED lamp core and into the DWV adapter fitting base.
18. *Set* (do not cement!) the 4 inch cap on the top of the lamp shade. Pushing down on the cap should trigger the button. You may want to install some soft weatherstripping foam to keep the weight of the cap from directly bearing on the button unless the cap is pressed down.
19. Congratulations and enjoy your new WLED controlled spiral LED lamp!