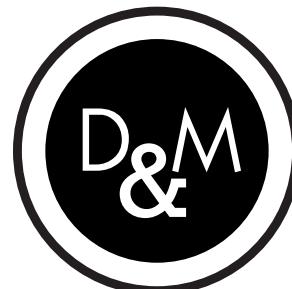
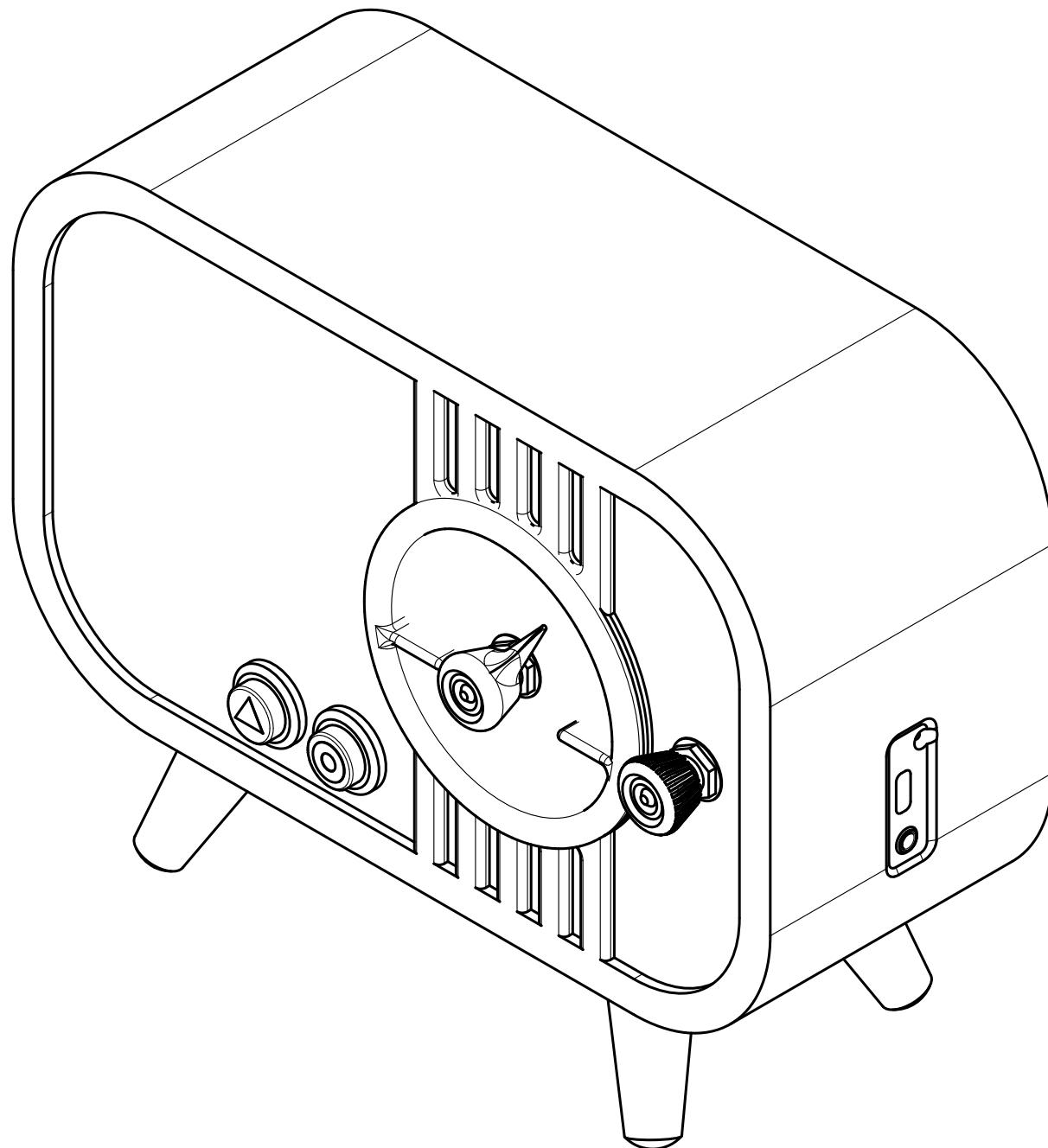


Revised May 2025

ASSEMBLY MANUAL

RADIO





STEP 1. put heat shrink onto two-pin leads

Materials:

- 500+ 2-pin connectors (all)
- 1000+ pieces precut heat shrink (all)

Place heat shrink over each wire, sliding down to the connector. Hand off to steps 2, 3, and 4.

STEP 3. Solder 2-pin connectors to buttons

Materials:

- 250+ 2-pin wire connectors from step 1 ($\frac{1}{2}$ total)
- 250+ buttons (all)
- Soldering iron + solder
- Flux

Dip each end of the wire in flux. Pick up a bead of solder on tip of iron and tack to solder lug. Hand off to step 5.

CAREFUL! This needs to happen fairly fast to prevent the lug from heating up the internals and displacing the button innards

STEP 5. Heat shrink buttons, toggles and speakers

Materials:

- Heat gun
- 250 speakers from step 2
- 500 buttons from step 3
- 250 toggle switches from step 4

Shrink the heat shrink with the heat gun at 170°C. (Higher temperature may be needed to get the heat shrink to shrink fully, but be mindful of melting the plastic in the buttons.) Hand buttons off to step 6, speakers to step 9, and toggles to step 20.

STEP 2. Solder 2-pin connectors to speakers

Materials:

- 125+ 2-pin wire connectors from step 1 ($\frac{1}{4}$ total)
- 125+ speakers (all)
- Soldering iron + solder
- Flux

Place each end of the wire through solder lug and fill hole with solder. Hand off to step 5.

STEP 4. Solder 2-pin connectors to toggle switches

Materials:

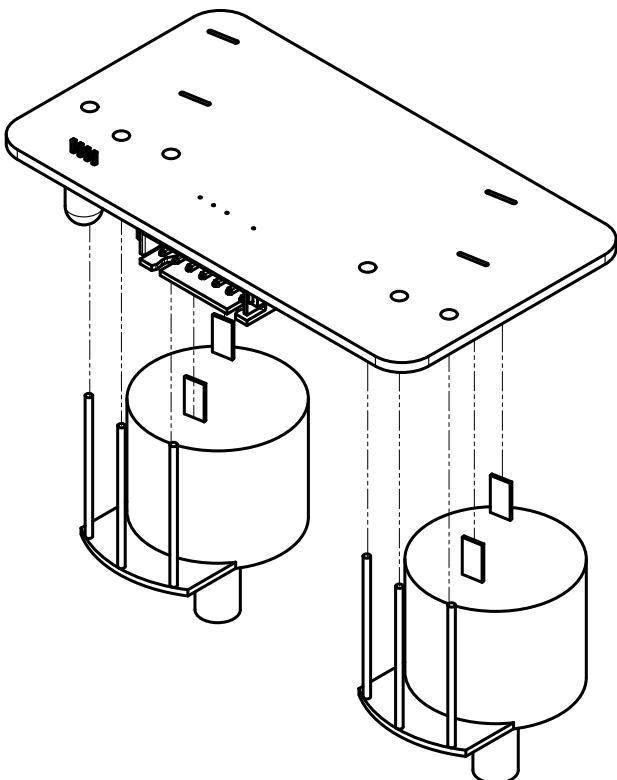
- 250+ 2-pin wire connectors from step 1 ($\frac{1}{2}$ total)
- 250+ buttons (all)
- Soldering iron + solder
- Flux

Dip each end of the wire in flux. Pick up a bead of solder on tip of iron and tack to solder lug. Hand off to step 5.

Materials:

- 250+ potentiometers (all)
- 125+ front daughterboards
- Soldering iron + solder

Place two potentiometers upside down and then place daughterboard onto potentiometers (silkscreen down). Ensure daughterboard is level, then solder all 10 joints. Hand off to step 16.

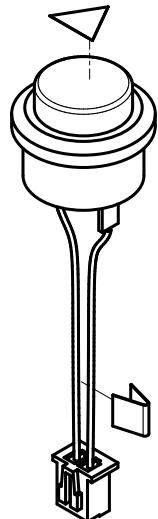


STEP 6. Solder pots on front daughterboard

Materials:

- 125+ triangle stickers (all)
- 125+ buttons from step 4 ($\frac{1}{2}$)
- Masking tape

Affix sticker to button. Mark wire with tiny ($\frac{1}{4}$ ") strip of masking tape, approximately 1" away from the base of the connector. Hand off to step 15.

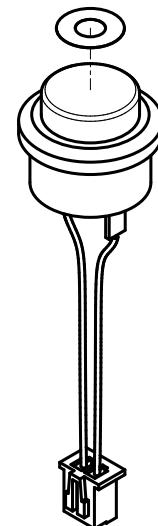


STEP 7a. Sticker triangle buttons and tape leads

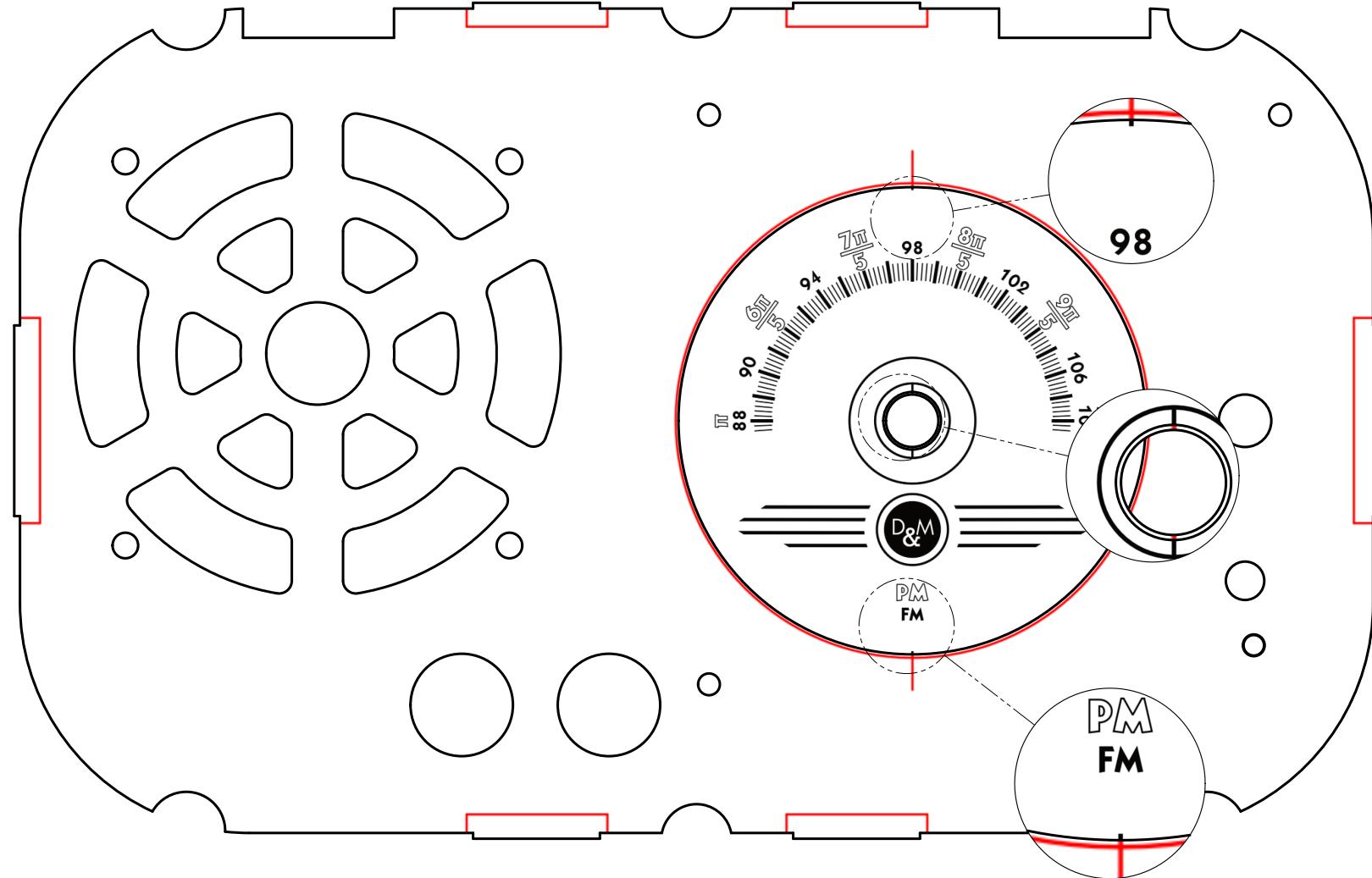
Materials:

- 125+ circle stickers (all)
- 125+ buttons from step 4 ($\frac{1}{2}$)

Affix sticker to button. **Do not** place tape on wire. Hand off to step 15.



STEP 7b. Sticker circle buttons

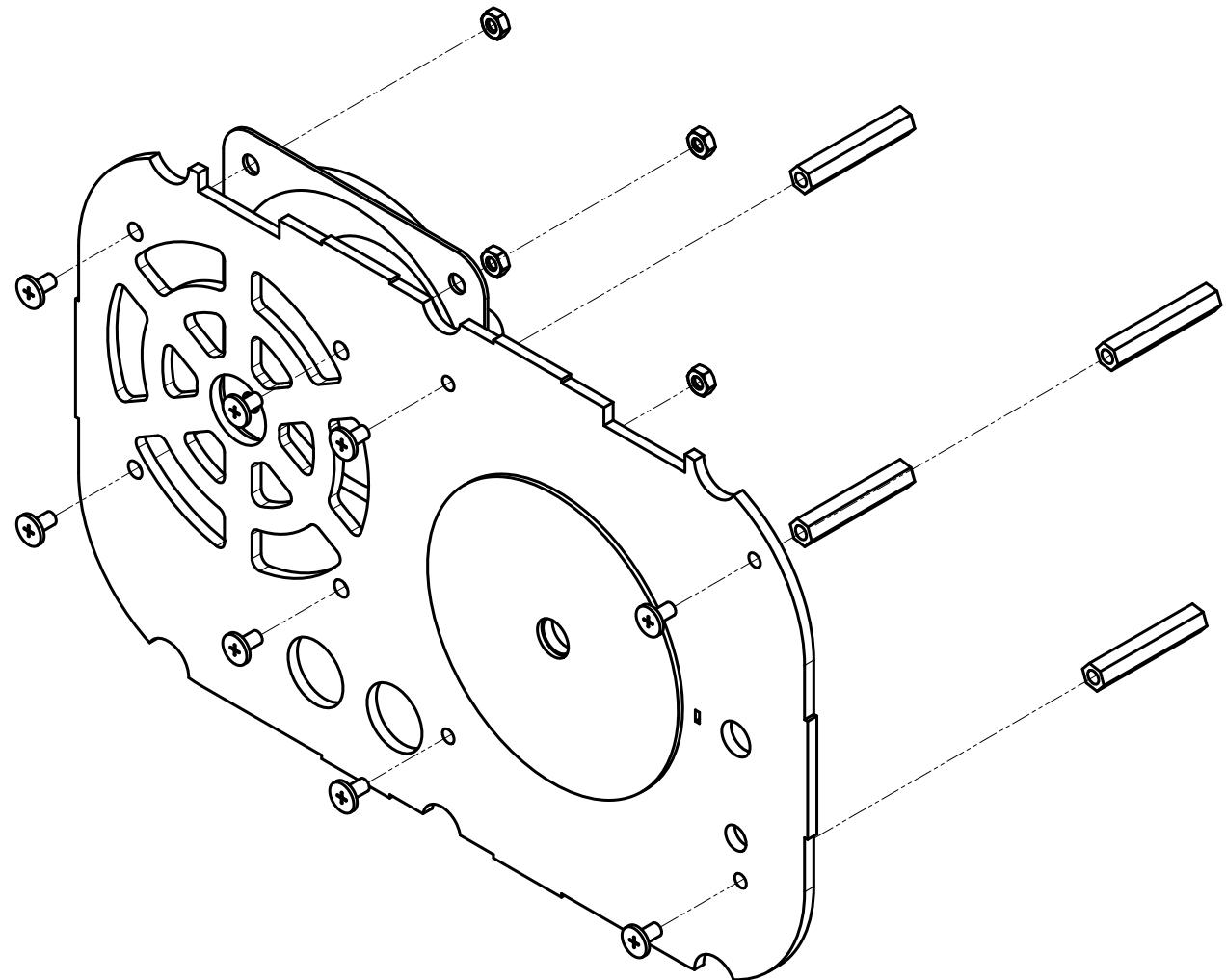
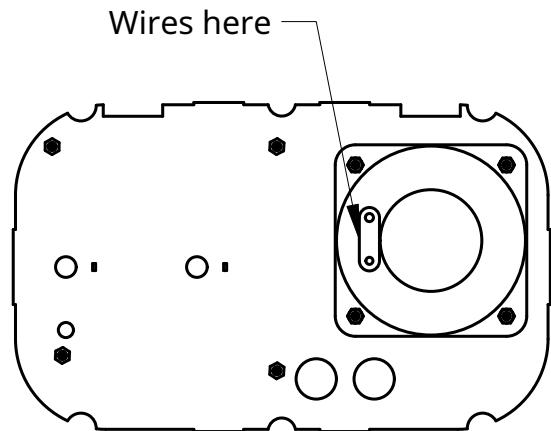


Materials:

- 125+ dials
- 125+ front panels

Ensure dial is centered within circle and vertical marks are aligned. Peel adhesive backing and stick to front panel. Hand off to step 9.

STEP 8 AFFIX DIAL

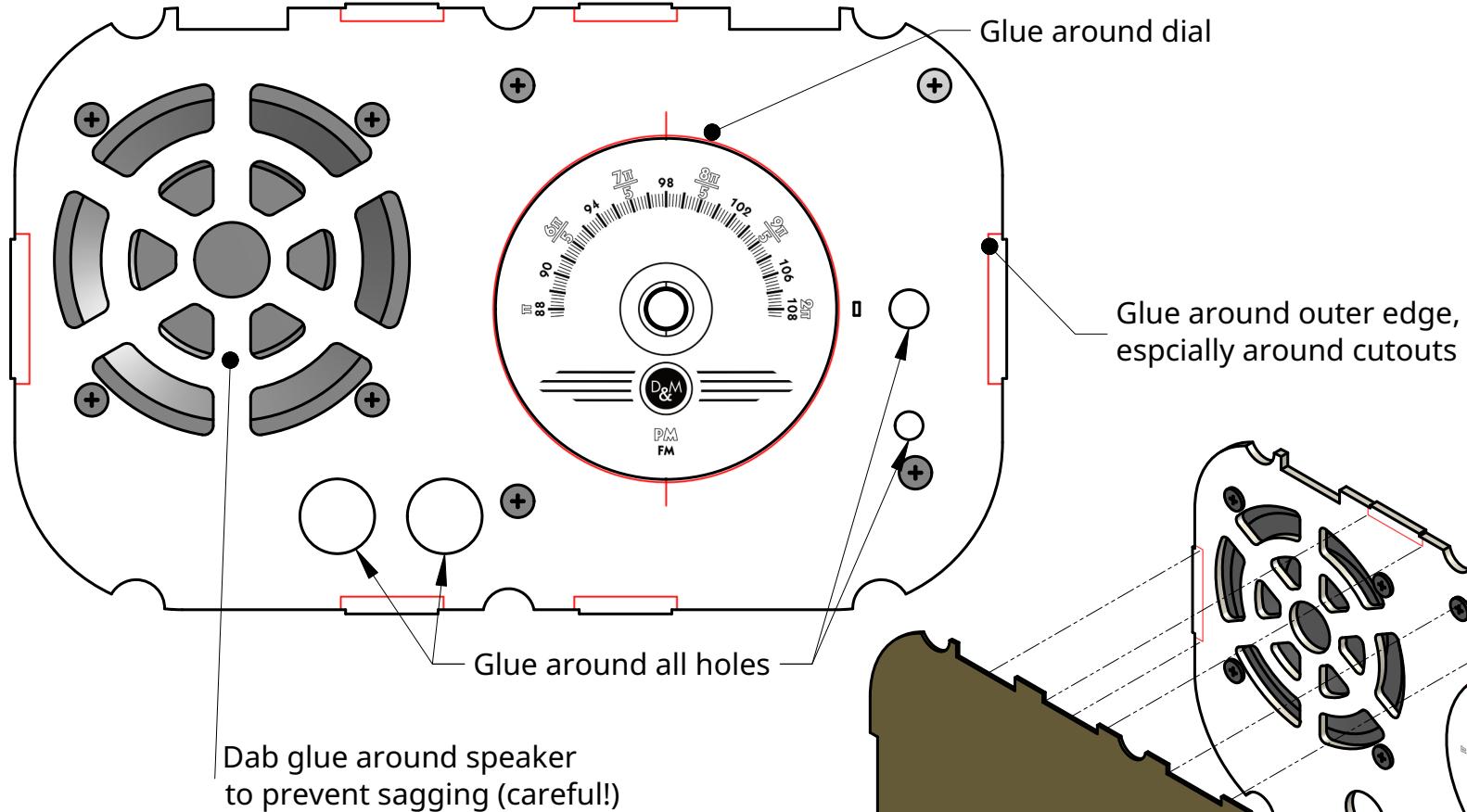


Materials:

- panels from step 8
- speakers from step 4
- 1000+ M3 screws ($\frac{2}{3}$ total)
- 500+ M3 nuts (all)
- 500+ M3 standoffs (all)
- # 1 Phillips screwdrivers
- 5.5mm socket wrench

Attach 4 standoffs to back of panels. Do not over tighten. Place speaker on board with leads facing the middle of the panel, towards standoffs. Attach speakers with screws and bolts. Tighten with socket wrench. Hand off to step 11.

STEPS 9 + 10. ATTACH STANDOFFS AND SPEAKER

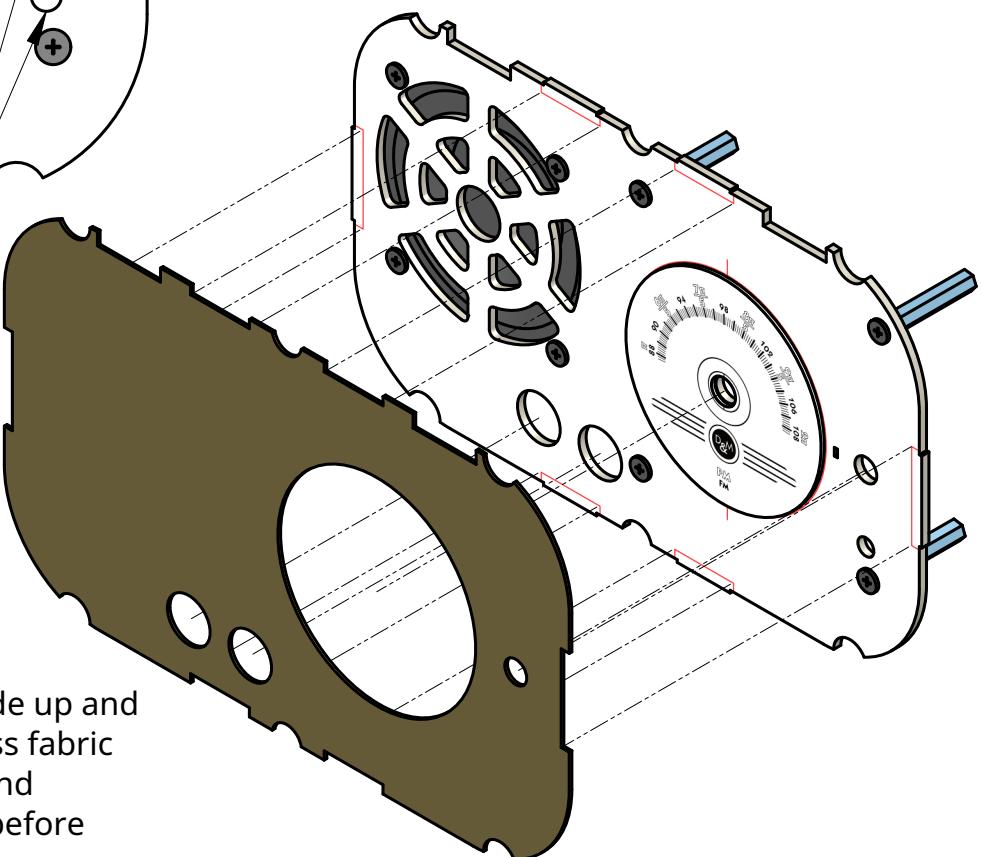


Materials:

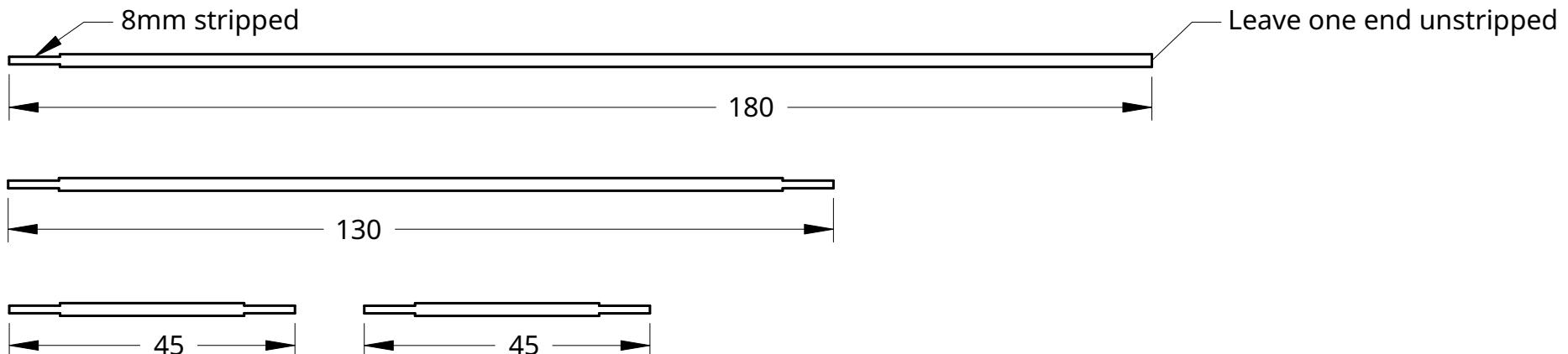
- panels from step 10
- 125+ fabric panels (all)
- superglue

Align fabric with tabs around edges and all holes. Flip right side up and apply glue around outer edge and all holes, and carefully press fabric down. Do the same for the left side, dabbing glue lightly around speaker holes to keep fabric from sagging. Allow time to dry before use in step 14.

Note: be careful in areas that will be visible as the fabric will wick the glue if applied too thickly



STEP 11. AFFIX FABRIC COVER

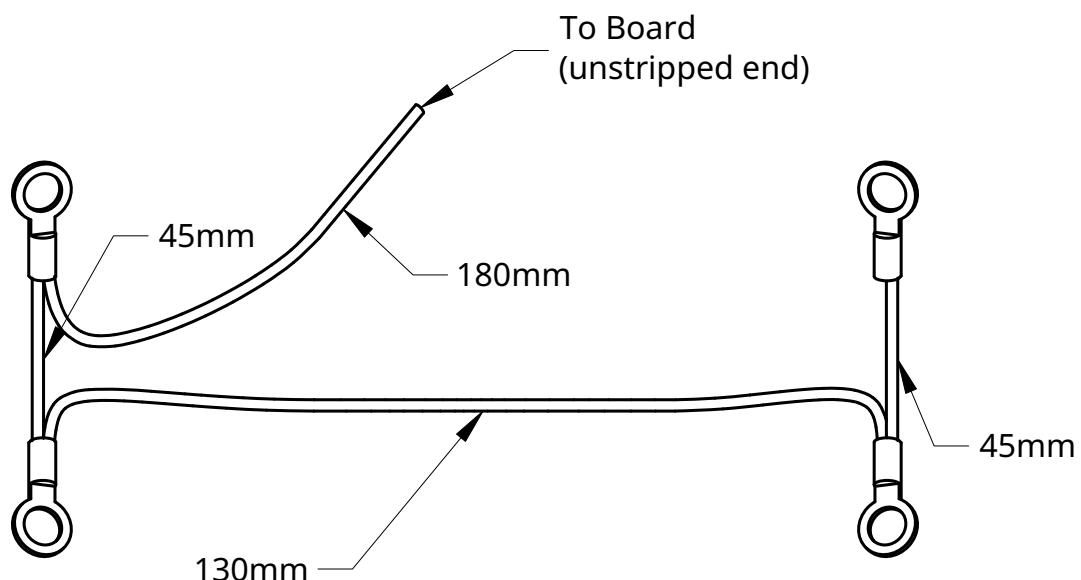


WIRE LENGTH TEMPLATES

Materials:

- yellow wire
- wire snips
- wire strippers
- 500+ ring terminals
- terminal crimper

Cut 4 lengths of wire denoted at the top of the page, stripping 8mm off each end except the longest wire, which has one unstripped end. Crimp stripped ends to ring terminals as depicted in the image.



**CAREFUL! The wire likes to slip out of the end.
Double check that it's seated correctly once the
terminal is held firmly in the crimper but before
cranking down fully to crimp the end.**

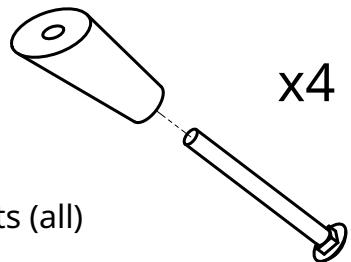
STEPS 12 + 13 CUT WIRE AND CRIMP WIRE HARNESS

STEP 14A. ASSEMBLE LEGS

Materials:

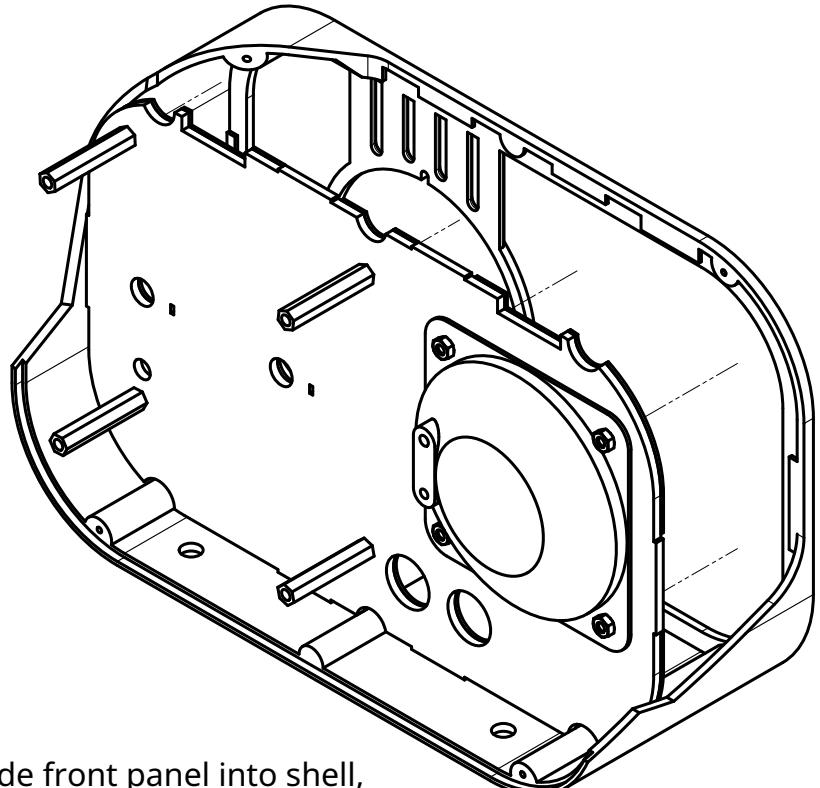
- 500+ legs (all)
- 500+ 10-24 carriage bolts (all)

Slide legs onto carriage bolts.

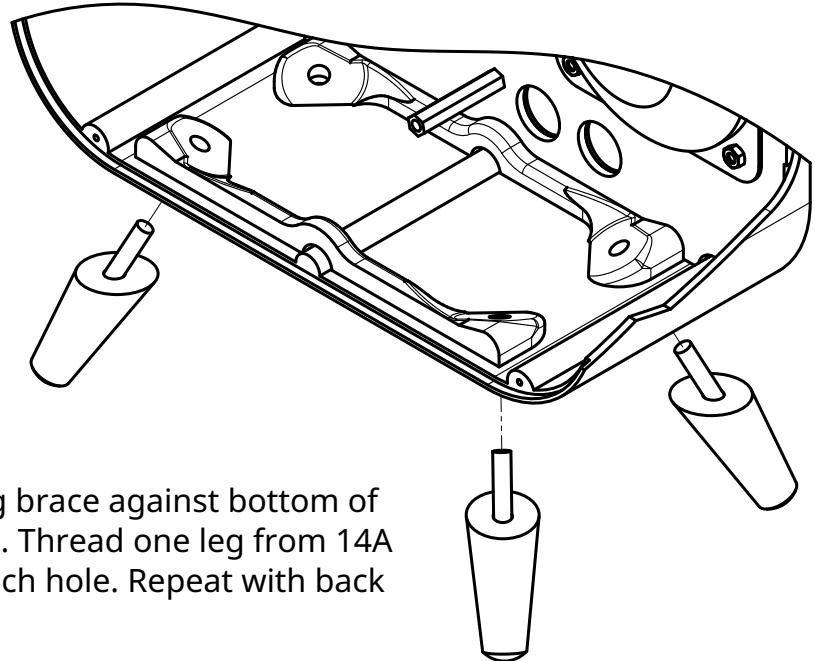


Materials:

- panels from step 11
- wire harness from step 13
- legs from step 14a
- 125 radio shells (all)
- 250+ leg braces (all)
- 500+ lock washers (all)
- 500+ 10-32 nuts (all)
- 250+ top lock pieces (all)
- 250+ M2 screws ($\frac{1}{3}$ total)
- socket wrench for #10 nuts
- # 1 screwdriver

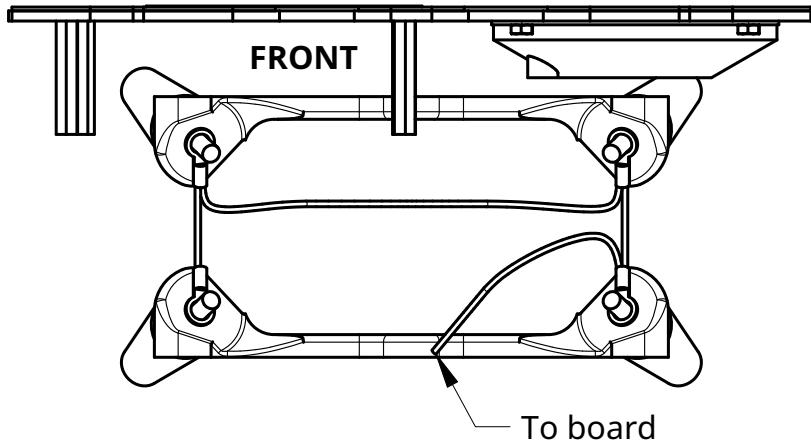


I. Slide front panel into shell, making sure dial is aligned with ring.

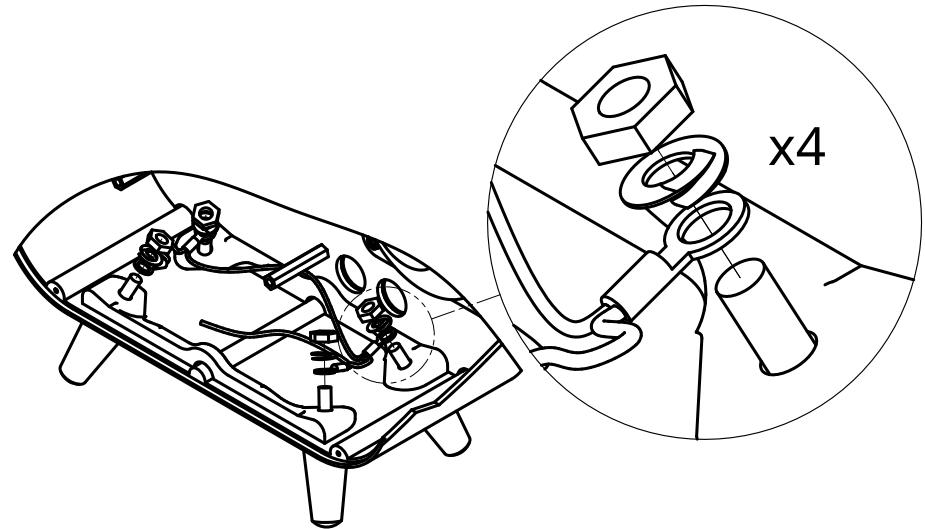


II. Press leg brace against bottom of front panel. Thread one leg from 14A through each hole. Repeat with back legs.

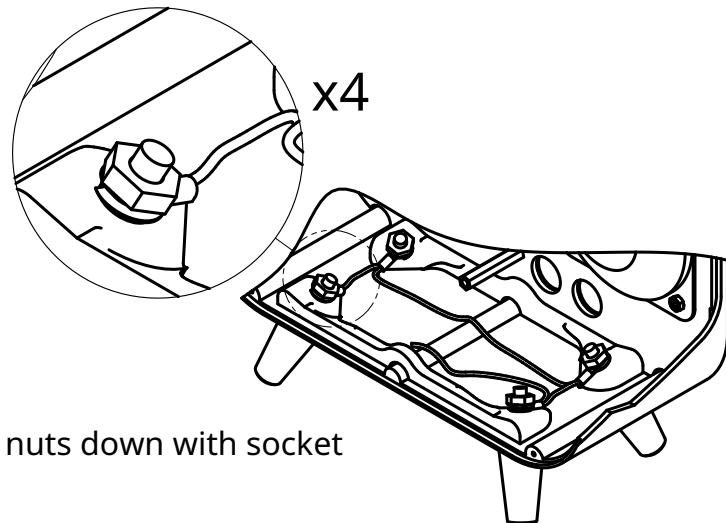
STEP 14. ASSEMBLE FRONT PANEL INTO SHELL (1/2)



III. Place ring connectors from wire harness on legs as shown.

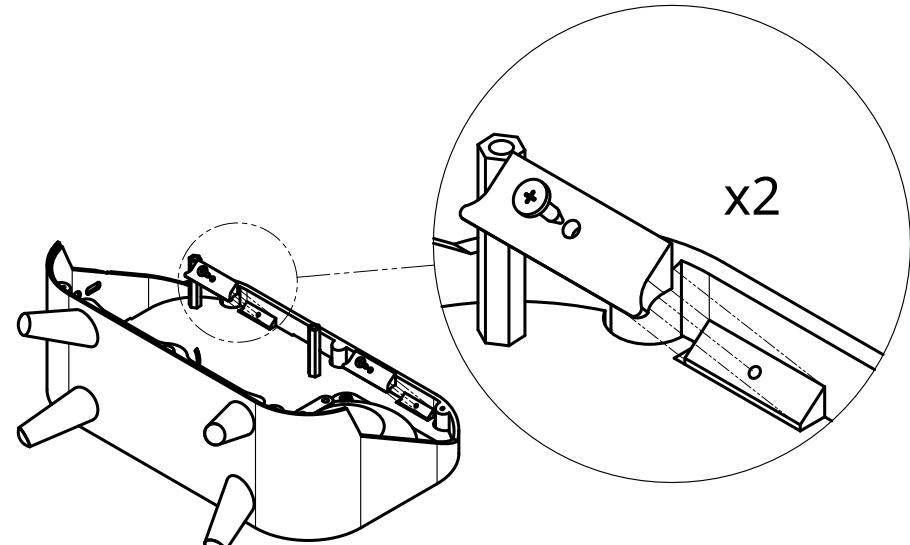


IV. Place a lock washer and a nut on each leg.



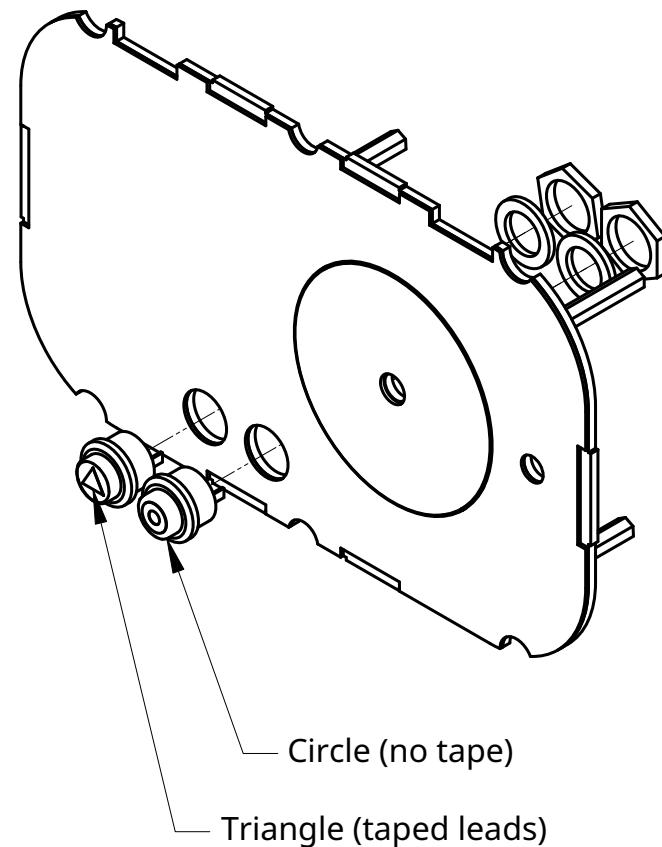
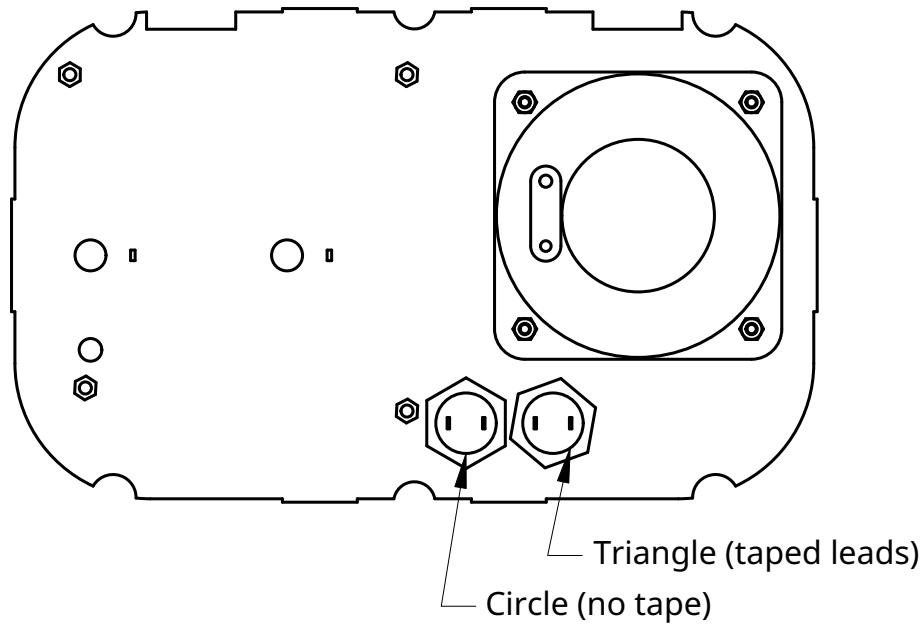
V. Tighten nuts down with socket wrench.

WARNING: Be careful of the legs twisting as the nuts tighten down



VI. Insert M2 screw into locks. Place lock into shell and screw down.

STEP 14. ASSEMBLE FRONT PANEL INTO SHELL (2/2)



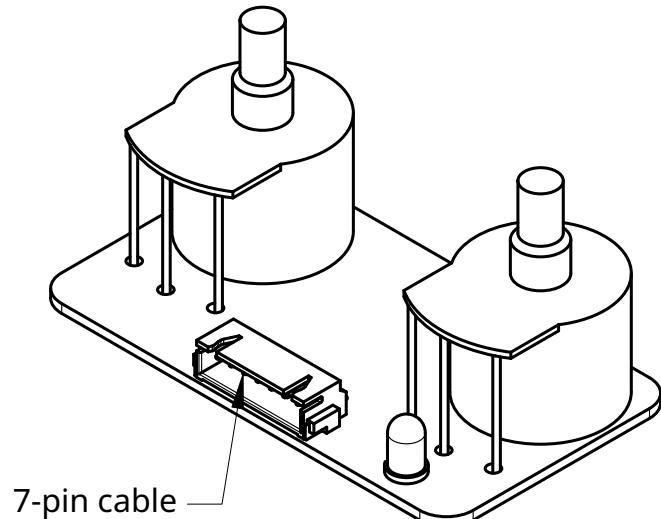
Materials:

- shells from step 14
- buttons from step 7

Unscrew nuts and washers from a triangle button and circle button. Make sure there is tape on the triangle button lead. Insert triangle button into hole closest to speaker and circle button into hole closest to dial.

Inspect the back to ensure that the tape is on the lead of the rightmost button. Place washers on buttons and fasten nuts.

STEP 15. ATTACH BUTTONS



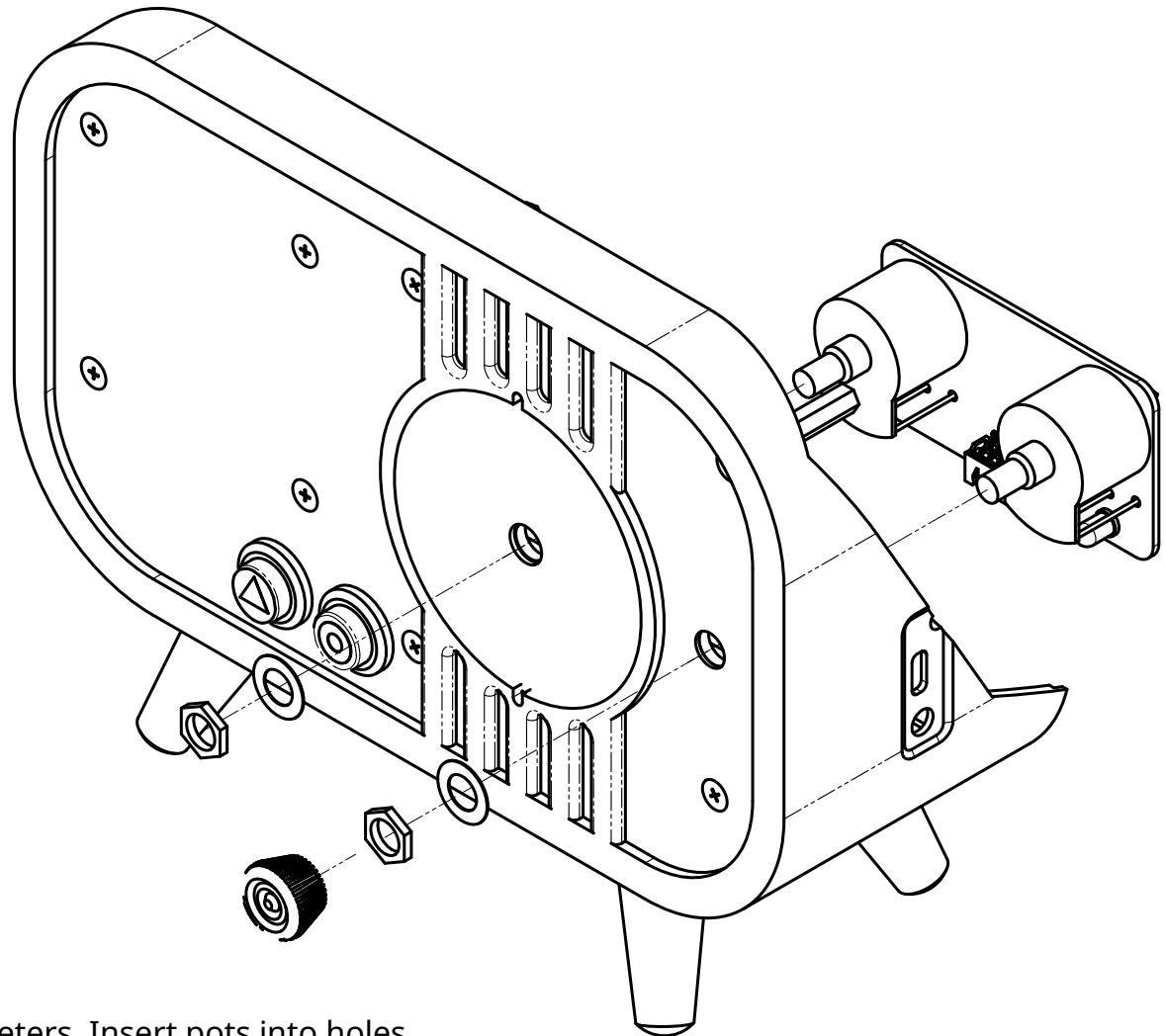
Materials:

- shells from step 15
- potentiometer boards from step 6
- 125+ volume knobs (all)
- 125+ 7-pin cables (all)

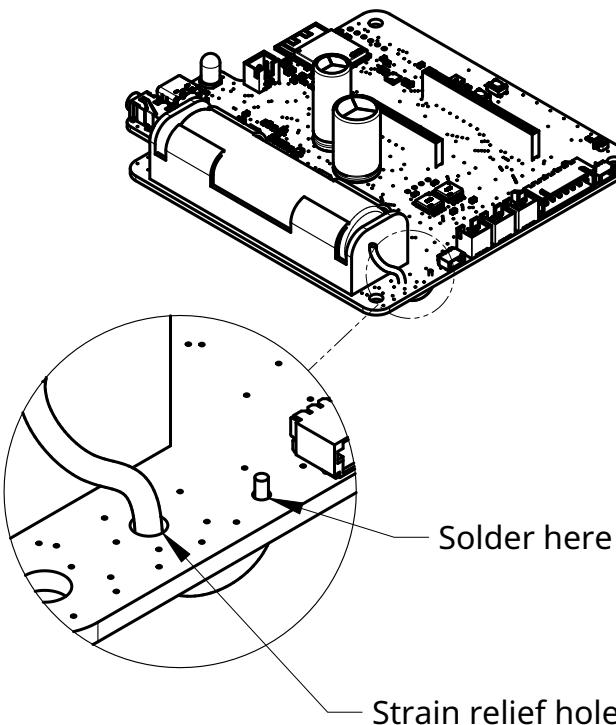
Plug 7-pin cable into board.

Unscrew nuts and washers from potentiometers. Insert pots into holes, making sure that the connector faces down. Place washers on pots and fasten nuts, taking care not to twist fabric.

Once pots are fastened, press a volume knob onto the right pot (not in the dial). The frequency knob will be attached during the QC step.



STEP 16. ATTACH POTENTIOMETERS

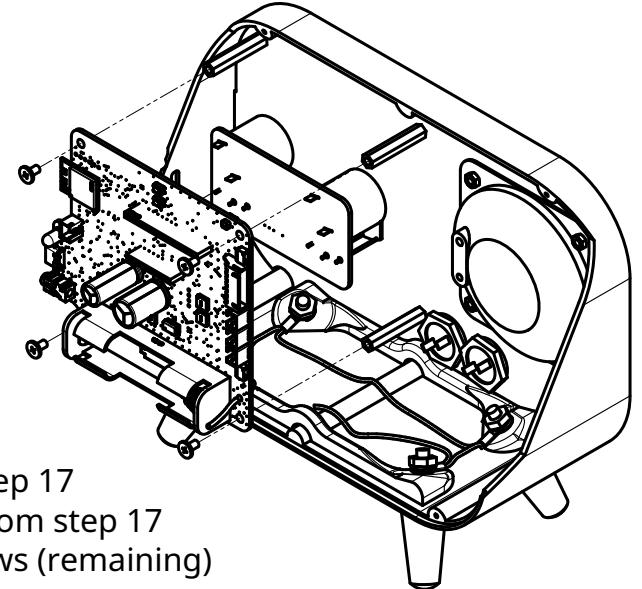


- Materials:
- wire harnesses from step 15 (in shell)
 - main boards
 - soldering iron
 - solder
 - wire strippers

Strip 3-5mm off end of wire harness. Pass down through strain relief hole and back up through solder pad. Solder in place.

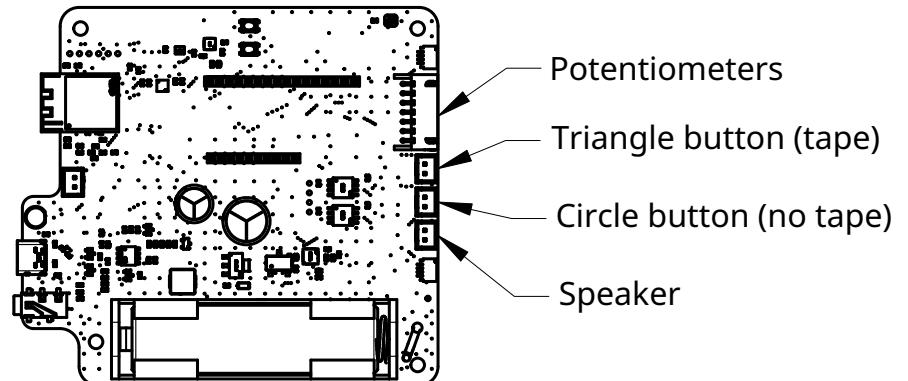
STEP 17. SOLDER WIRE HARNESS TO MAIN BOARD

- Materials:
- shells from step 17
 - main board from step 17
 - 500+ M3 screws (remaining)



Screw board onto 4 standoffs using M3 screws.
Do not overtighten.

Plug in pots, buttons, and speaker.



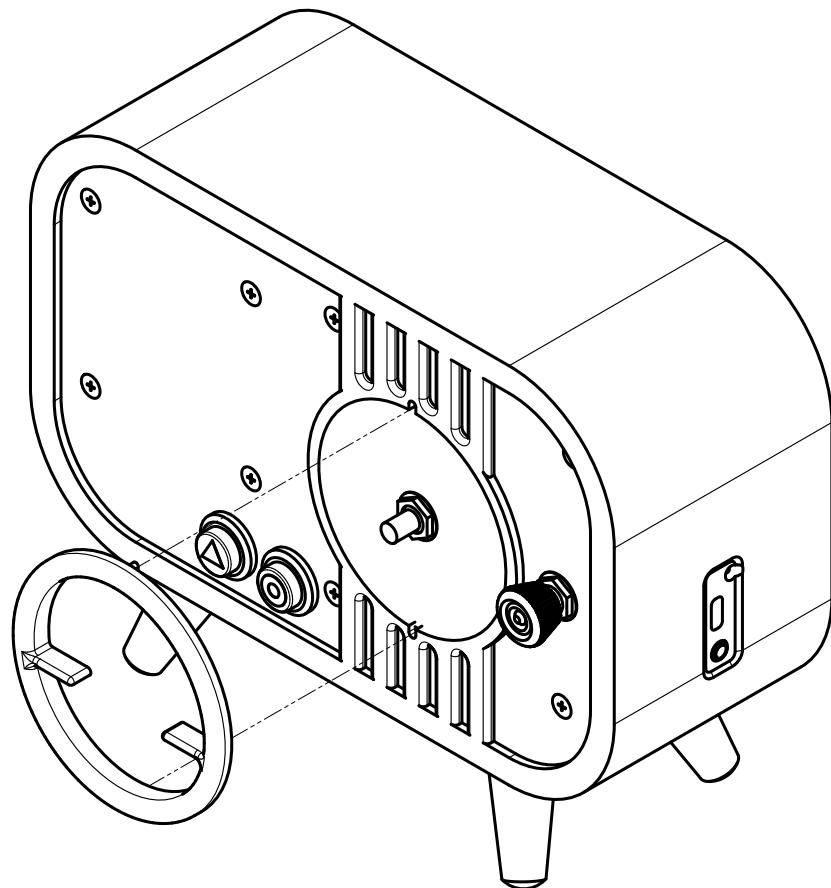
STEP 18. ATTACH MAIN BOARD TO STANDOFFS

Materials:

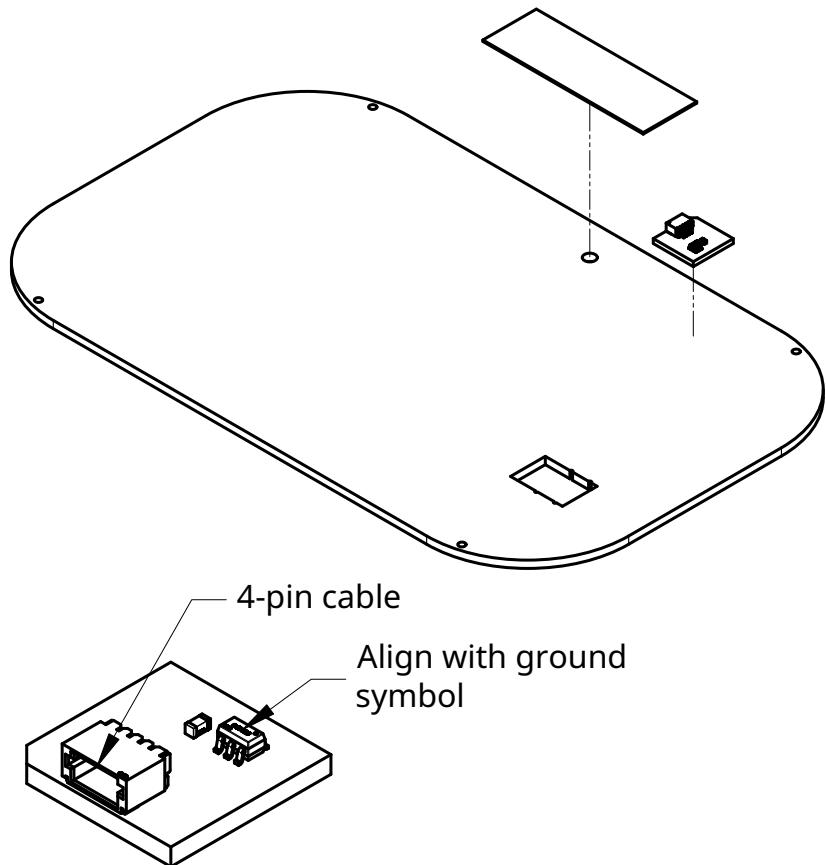
- shells from step 18
- 125+ rings
- superglue
- acetone and/or black permanent marker

Apply superglue to rear of ring. Avoid overapplication as superglue will discolor ring and shell where visible. Press ring into shell and hold until partially set.

Once fully dry, use acetone and/or black permanent marker to clean up discoloration.



STEP 19. GLUE RING TO FRONT



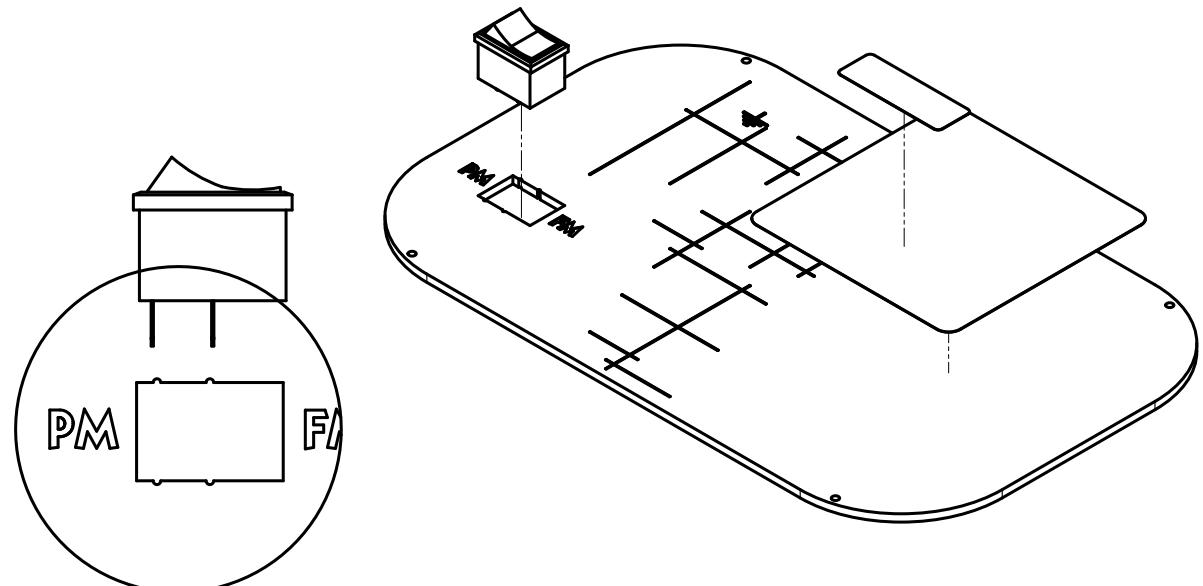
Materials:

- 125+ back panels
- 125+ magnet daughterboards
- 125+ 4-pin cables (all)
- Acetate
- Masking tape
- Superglue

Cut acetate into strips approximately 2.5"x1". Use superglue on either side of the light hole to attach the acetate to the inside of the back plate. Cover acetate with a strip of masking tape. (Together these prevent teams from poking through the light hole and add some diffusion to improve the sensor's sensitivity)

Attach magnet daughterboard to inside of back plate using superglue, aligning the chip with the center of the ground symbol on the outside. Plug 4-pin cable into daughterboard

STEP 20a. ASSEMBLE INSIDE OF BACK PANEL



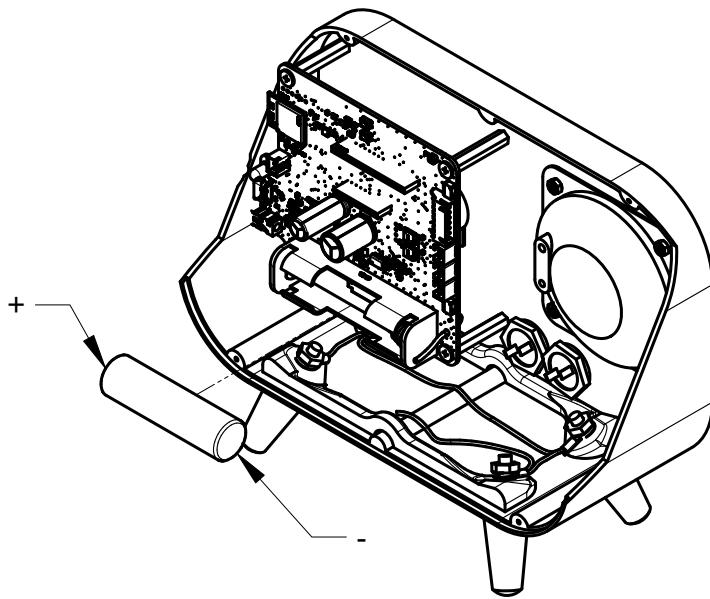
Snap toggle switch into outside of back panel. Make sure to align solder lugs on the switch with the two notches in the back panel cutout.

Roughly center warning stickers in the open space on the right side of the back panel and attach. Attach a unique bar code sticker to each back panel.

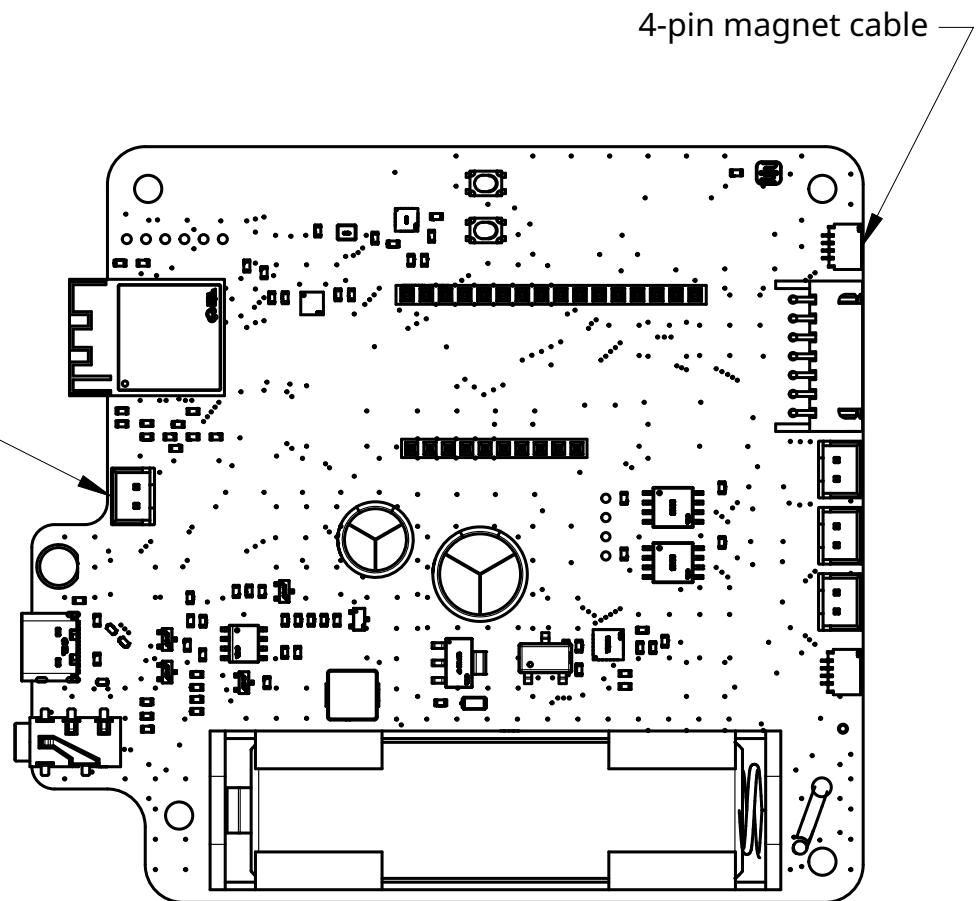
Materials:

- Back panels from step 20a
- 125+ toggle switches from step 4
- 125+ back stickers
- 125+ unique bar code stickers

STEP 20b. ASSEMBLE OUTSIDE OF BACK PANEL



2-pin toggle cable



4-pin magnet cable

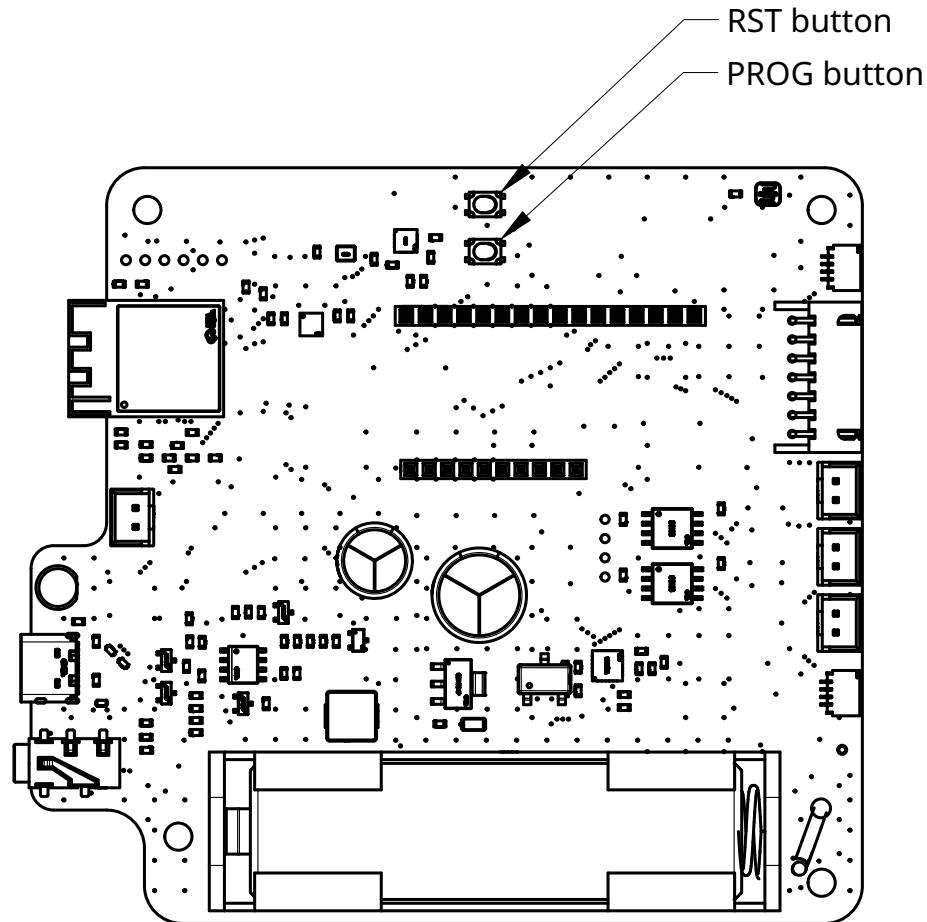
Materials:

- shells from step 19
- back panels from step 20
- 125+ batteries (all)
- 500 M2 screws (all remaining)
- 500 tamper-evident stickers (all)

Insert battery into main board. **WARNING:** Main PCB does not have reverse polarity protection, so **MAKE SURE TO INSERT IN CORRECT ORIENTATION.**

Connect 2-pin cable from toggle switch and 4-pin cable from magnet switch to the main board as indicated.

STEP 21a. CONNECT BACK PANEL



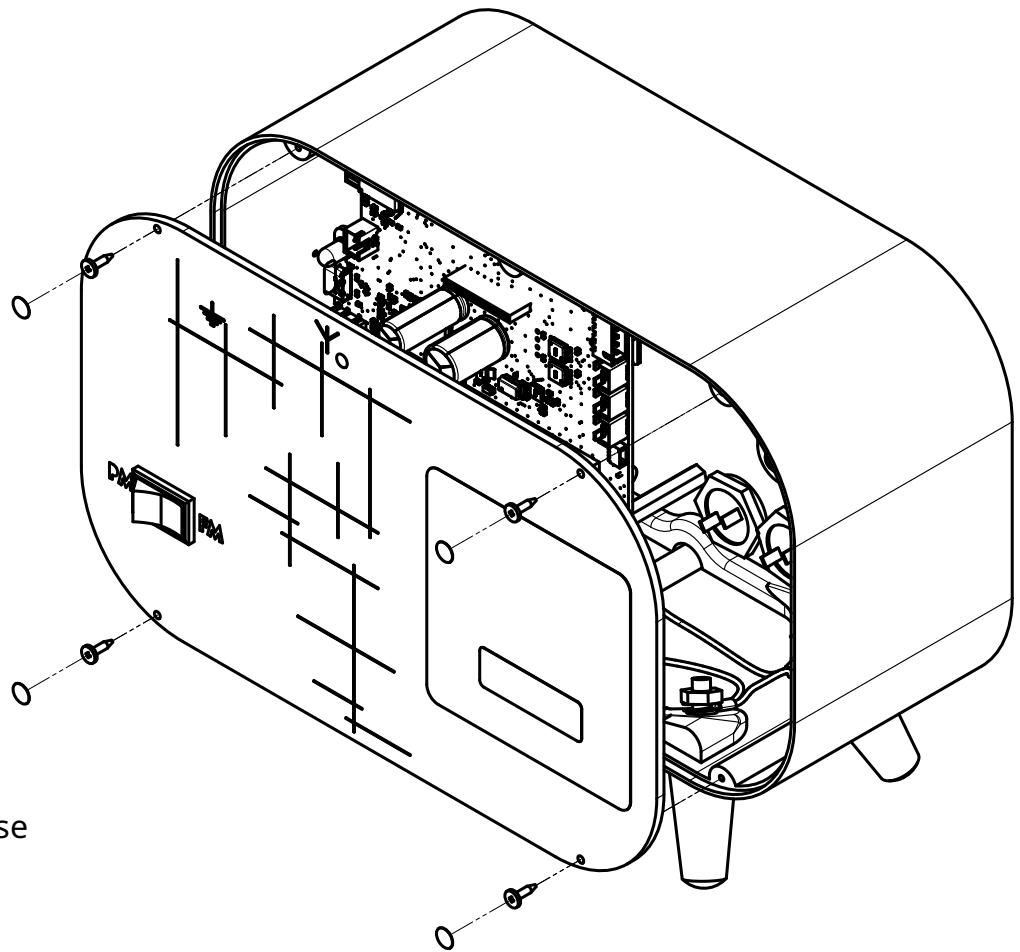
Flash initial firmware onto main PCB prior to sealing, as the first flash will require access to the RST and PROG buttons. For details on the process, see the [firmware GitHub repository](#).

STEP 21b. FLASH AND VALIDATE

Materials:

- shells and back panels from step 21a
- 500 M2 screws (all remaining)
- 500 tamper-evident stickers (all)

Place back panel into inset shelf on back of the shell. Use the remaining screws to screw it into the shell. Cover screw heads with tamper-evident stickers.



STEP 21c. ATTACH BACK PANEL