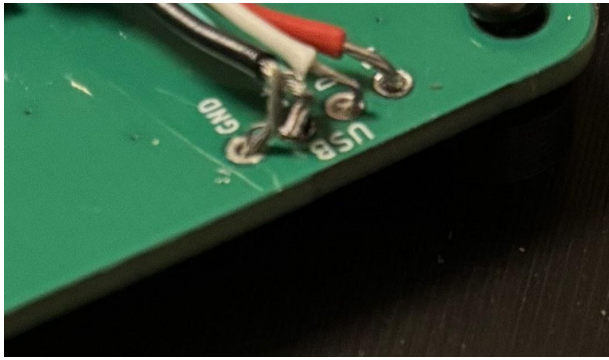


Bill of materials

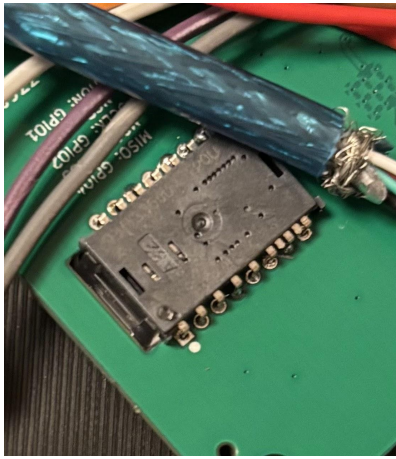
Item	Qty	Description	Vendor	Cost
Main PCB (+ electrical components)	1	PCB for main sensor and microcontroller	JLCPCB	\$24.96 +\$5.74 (missing component)
Auxiliary PCB (+ electrical components)	1	PCB for additional sensor	JLCPCB	\$16.15
Mouse button mount PCB	3	PCB to connect mouse buttons	JLCPCB	\$3.50
Optical sensor (PixArt PMW3360)	3	Optical sensor for mouse and trackball function	Aliexpress	\$12.38
Mouse switches (Kailh GM08)	3	Mouse switches for 3 mouse buttons	Aliexpress	\$0.99
Scroll encoder (Kailh 8mm)	1	Encoder for scroll wheel capability	Aliexpress	\$0.92
POM bearing balls	3	Bearing balls for smoother trackball rotation	Aliexpress	\$3.01 (pack of 100)
USB type A cable	1	Cable for connection to computer	Already have	free
M3x4 machine screws	4	Fastening top and bottom of case	Lowes	\$2.48 (pack of 14)
M2x4 machine screws	14	Fastening PCBs to case	Already have	free
Insulated copper wire (2 gage)	6	Connecting auxiliary PCB to main board	Already have	free
Trackball (34mm)	1	Trackball	Amazon	\$11.99

Assembly procedure:

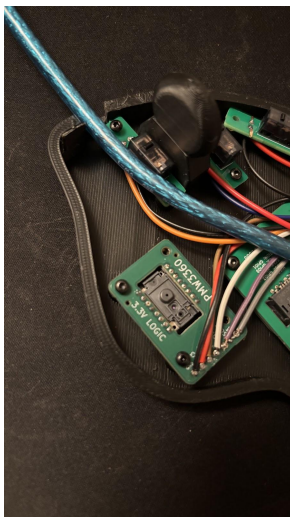
1. Solder the USB cable to the main PCB by identifying the designated solder pads. Strip and tin the ends of the USB cable wires, then solder each wire to its corresponding pad, ensuring a secure and clean connection. Verify continuity with a multimeter to confirm proper soldering.



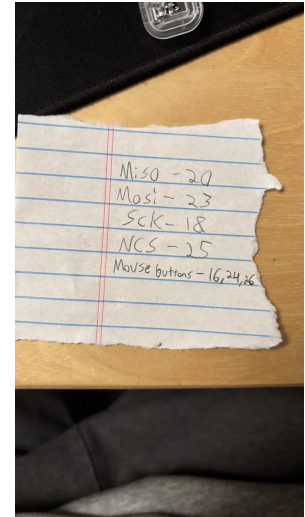
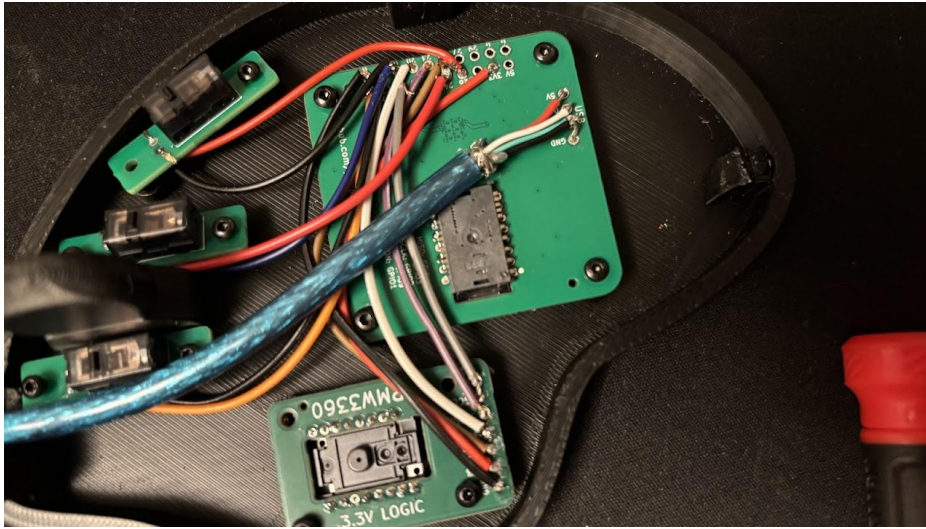
2. Solder the first optical sensor to the main PCB by aligning the PixArt PMW3360 sensor with its designated mounting points. Insert the sensor pins into the PCB through-holes and carefully solder each pin, ensuring no excess solder bridges adjacent connections. Inspect the solder joints and check for proper alignment.



3. Solder the second optical sensor to the auxiliary PCB by positioning the sensor onto the designated pads. Insert and solder the sensor pins securely, ensuring proper alignment. Inspect the solder joints for strength and possible short circuits.



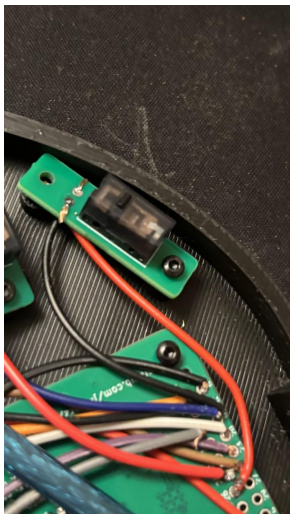
4. Solder the auxiliary PCB to the main PCB according to the specified pinouts. Align the auxiliary PCB with the main PCB as per the pinout diagram (lined paper) and solder the connecting wires or headers between both PCBs, ensuring solid electrical contact. Double-check pin alignment to prevent reversed connections.



5. Solder the three mouse switches to the button PCBs by placing each Kailh GM08 switch onto its respective mounting PCB. Ensure the correct orientation before soldering the switch leads carefully to prevent excess heat damage. Test the click response of each switch to confirm proper functionality.



6. Solder the button PCBs to the main PCB according to the pinout diagram. Position each button PCB onto the main PCB and solder the connection points securely, ensuring all buttons are properly aligned. Verify electrical continuity with a multimeter before proceeding.



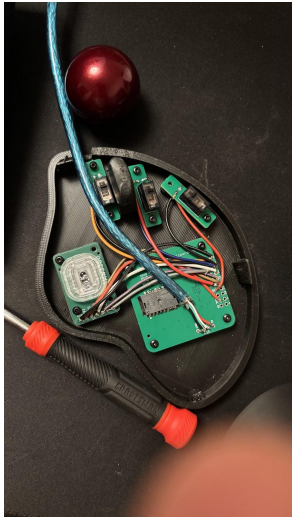
7. 3D print the base and shell using the provided STL files. Print with durable material such as PLA, ABS, or PETG, ensuring dimensional accuracy. Clean up any excess material or rough edges and test-fit the components to ensure a proper fit within the printed housing.



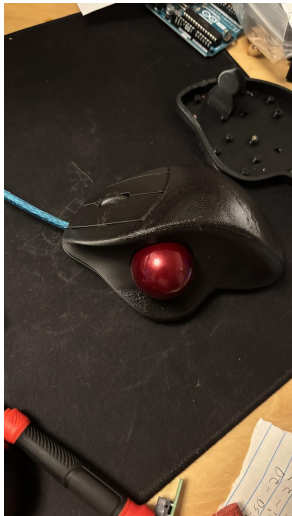
8. Insert the threaded inserts into each standoff using a soldering iron. Heat each brass threaded insert, then carefully press it into the corresponding standoff hole in the 3D-printed base. Allow the insert to cool and set securely before applying force.



9. Mount the main PCB, auxiliary PCB, and button PCBs to the base by aligning them with their respective mounting positions. Secure each board using M2x4 machine screws, ensuring they are firmly in place. Confirm that there are no loose connections or obstructions before proceeding.



10. Fasten the shell onto the base and place the trackball in its slot. Align the top shell with the base, ensuring all components fit properly. Use heated inserts to fasten the shell securely. Insert the 34mm trackball into its designated slot, ensuring smooth rotation. Perform a final check to confirm that all mechanical parts move as intended.



CAD Drawing:

