

How to fix the Steelseries Prime



Preface

This is not a review and I suggest you do not read it as such. I will be nitpicking and pointing out every flaw no matter how small. My intent with this document is to inform the designers of the prime lineup of both objective and subjective flaws in the design of these mice in hope that some of these issues are fixed within the current lineup and improvements are made in future generations of this product. I am familiar with both Steelseries "old" design (sensei and kinzu era) as well as their more modern sharp edge style design (rival 600, rival 310, rival 3/aerox 3/rival 107) as well as many other mouse shapes (xm1, viper, orochi v2, deathadder, g pro wireless, xtrfy m4, zowie FK/EC and more).

I am not affiliated with any peripheral manufacturer at the time of writing this document and all opinions are my own. 2 different Prime+ mice were used for testing. Mice were purchased directly from Steelseries own store (EU).

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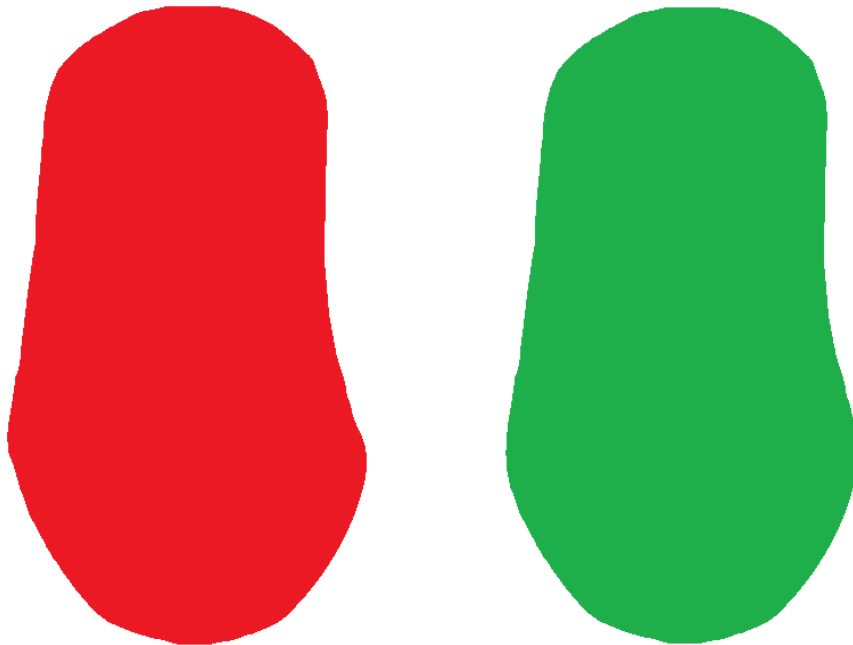
Part 1: Shape

The shape of the prime series is an EC2 inspired ergonomic shape that tries to implement Steelseries sharp edge design as seen on some current and older Steelseries products like the rival series of mice. It however, in my opinion, fails to apply Steelseries traditional design philosophy to this already well known shape. Outside of the intended claw grip the shape feels fairly awkward to use. In this chapter I will describe the flaws in the prime shape and propose some possible fixes. My goals here are to make the shape safer without affecting its use for the intended claw grip, although I've also made some small changes based on my personal preference that might slightly affect this grip. Overall if i were to design my own mouse from scratch it would look significantly different, but I wanted to stick with the Steelseries prime's feel for this project.

1. Back and thumb curvature

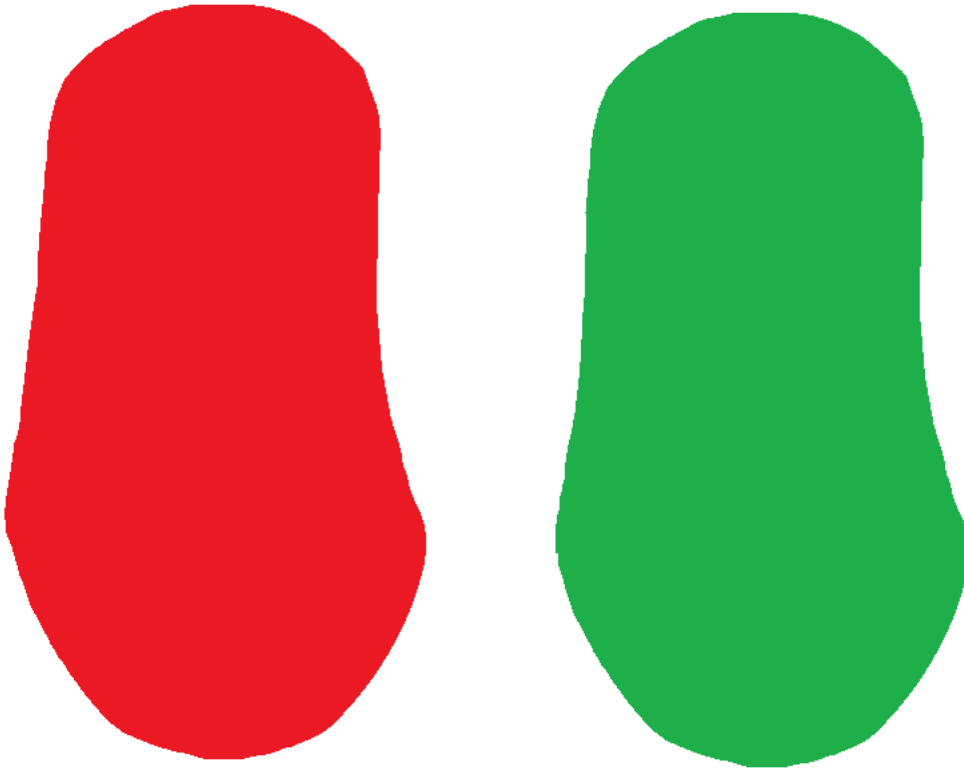
First of all the prime series feels disproportionately large on the right side, while feeling fairly narrow on the left side. This can be fixed in 2 ways:

1. Shift the back slightly towards the right side. This will balance out the width on both sides by slightly widening the left side while slightly narrowing down the right side. As a result the mouse should feel like it has a more balanced shape. If this change is made the sensor position should also be shifted accordingly.



Left: Original (red), Right: Adjusted (green)

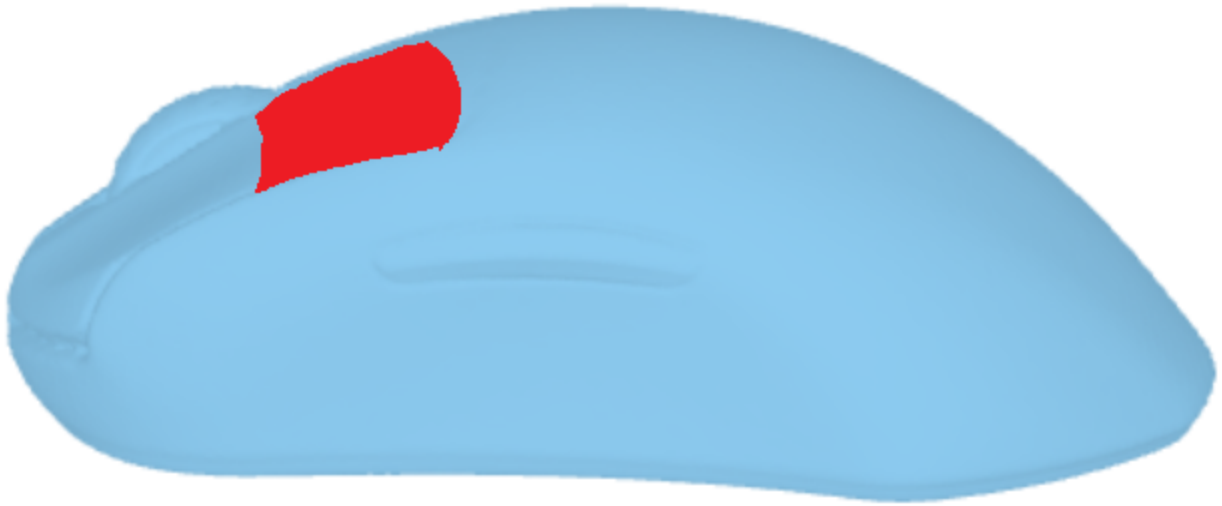
2. Narrow out the right side. This will also result in the mouse feeling more balanced by making both sides feel narrow. This change would make the prime fill a more unique niche as a very narrow ergo mouse however it would risk making the mouse too narrow for users with wide hands.



Left: Original (red), Right: Adjusted (green)

2. Button curvature

Secondly the main buttons on the prime have a fairly odd curvature to them. The front of the buttons all the way up to around $\frac{2}{3}$ of the way is fairly flat however, the last $\frac{1}{3}$ of the buttons have a noticeable bump upwards. While this doesn't affect users with a full claw grip (curled up fingers) users with a more relaxed claw, fingertip or palm grip might find that this bump gets in the way especially around the left mouse button, where the button curvature slants up drastically into the prime's EC-2 inspired slanted central hump. Flattening out the back $\frac{1}{3}$ of at least the left mouse button would allow for more relaxed finger placement and therefore allow more grip styles. This change would not affect the intended full claw grip because the areas that are being reshaped would never be points of contact for this grip.



Recommended changes (affected area colored red)

Additionally I'd like the inner groove on the main buttons to be slightly more emphasized. This wouldn't affect grip as much (except in some extreme scenarios where it could help the users fingers not slide towards the center as much) however it would give the mouse a more "Steelseries like" look as seen on the rival 3 or rival 310.

3. Center hump

In addition to the changes around the button I'd like to see the slanted central hump (that looks highly inspired if not flat out copied from the EC-2) to be flattened out a bit more to follow the button curvature more naturally. This would possibly be a slight improvement for fingertip and relaxed claw users while being a slightly more significant change for palm grip users. In the case of palm grip it would force the hand to be less tilted and more flat. You could potentially argue that a more tilted angle would feel better with a palm grip however, this niche is already filled by the Zowie EC series which, due to its button curvature, achieves it more effectively. Again this change should not impact claw grip users since the affected area is not a point of contact for them.

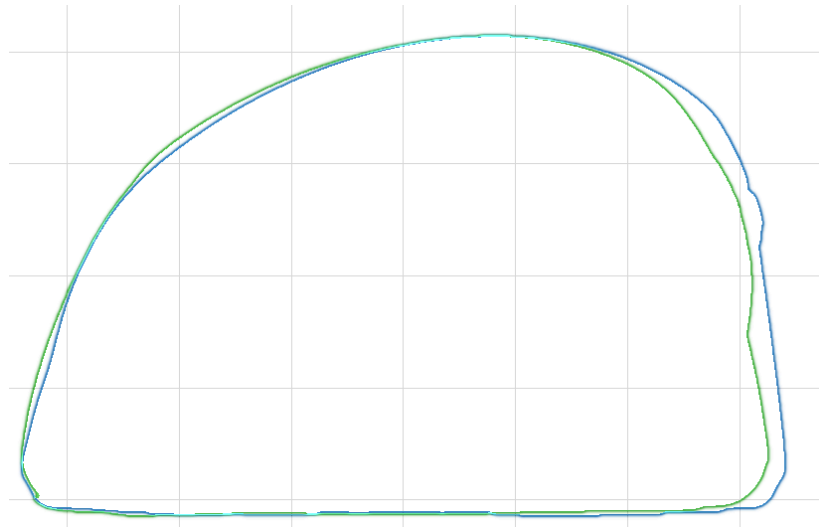


Recommended changes (affected area colored red)

4. Right side curvature

In my opinion there are objective flaws with the prime's right side curvature that should've never made it to the final product.

First of all let's start with the back curvature (around where the pinky usually is when holding the mouse with a claw grip). The prime curves in much more aggressively than the EC-2 in this area (see image below). This makes it fairly hard to touch the prime with more than just the tip of the pinky. This little contact can cause your fingers to shift around a bit when moving the mouse which causes your grip to be unstable. Note: this is especially noticeable near the back of the mouse but can still be felt near the middle. I would personally reshape the entire right side and smooth out the curvature to fix this issue.



EC-2 shape (green) vs Prime shape (blue), front view



Recommended changes (affected area colored red)

Second, near the back of the mouse, right where the curvature starts to move inwards, there is a fairly large and semi sharp bit of curvature that points outwards. This curvature doesn't add anything and can in some cases get in the way when holding the mouse (specifically grips with a lot of pinky contact). Since this curvature doesn't add anything I'd personally just remove it and smooth it out.



Recommended changes (affected area colored red)

Lastly, the front right side of the mouse is fairly flat. I'd personally like to see a sharper (more flat) inwards curve to keep it from sliding when lifting the mouse. The current inwards curve is fairly rounded which causes the angle to be less steep. I have to admit this isn't the biggest flaw and it is only really an issue when the coating/finish isn't grippy enough or when the user has sweaty hands but I'd still like to see this change made. For comparison older steelseries mice like the rival 310 and sensei had a far flatter inwards curve compared to the prime (see below).



Inwards curve, Prime (left) vs Rival 310 (right)



Recommended changes (affected area colored red)

5. Style

The distinct lines we've seen on other modern Steelseries mice (rival 3, rival 310, sensei 310 etc.) have been smoothed out quite a bit on the prime shape. Although it wouldn't affect grip in any way, I'd like to see these lines be more defined. This would set the prime apart stylistically from the other mice on the market and it (in my opinion) would look a lot better than the potato-like look that the prime has. Curiously these lines have also been smoothed out on the rival 5, showing a possible trend for future mice.



Recommended changes (affected area colored red)

Part 2: Main clicks

The clicks on the Steelseries prime feel fine to me (for optical clicks at least) however they have one very large issue, click latency. The optical clicks on the Steelseries prime seem to have around 8.5ms (wired) and 7.5ms (wireless) click latency. This makes the prime's main click some of the worst performing optical switches out there. The clicks are so slow that they're beaten by mechanical switches in most current high end mice from for example: Logitech, Razer, Zowie, Endgame Gear, XTRFY, Vaxee and more at ≤ 4 ms. It's even beaten by the mechanical clicks in Steelseries own aerox 3 at around 6ms. Although click latency isn't the only measurement of click performance (minimum click duration and durability for example) it is one

of the most important measurements of click performance since it directly impacts reaction time. The 8.5ms latency seen is enough to be noticeable for some users and is in stark contrast to the “quantum speeds” that Steelseries advertised in the past (now removed, see below). In order to fix this click latency issue I would suggest implementing eager or symmetrical eager debounce depending on bouncing behavior of the switches.

How It Works

The Prestige OM™ switch has a steel torsion spring held in place by a specially-milled neodymium magnet. This magnetic force creates consistency and precision so that every click actuates with the same amount of release force. This switch, in conjunction with an input beam of infrared light, allows each click to register at quantum speeds, delivering unrivaled response times.

Old (now removed) advertisement for Steelseries optical switches

Part 3: Side buttons and scroll wheel

Side buttons

The side buttons on the prime are very similar to those on the rival/aerox 3. And just like the side buttons on those mice, they are pretty much universally hated. In my opinion there are 2 issues. 1. The shape of the buttons makes them feel bad to press. The pyramid shape makes it so there's very little contact with the thumb and causes the buttons to dig into the finger when they are pressed. Flattening the buttons would make them feel better. 2. The buttons' fairly high actuation force, combined with the lack of post travel makes them feel heavier than they actually are. To fix this different switches should be used and the button construction should be adapted to allow more post travel. Good alternative switches (in my opinion) would be huanos yellow dot (found in xtrfy m4) or TTC green dot (found in XM1R). One additional note on the post travel is that although some post travel is needed to cushion out the button press, too much post travel can make the buttons feel poor therefore only a small amount of post travel should be introduced in the side buttons.

Scroll wheel

The scroll wheels on both my units seemed to have a significant amount of up/down wobble. This wobble causes a very distinct rattling sound when scrolling and shaking the mouse. It also slightly impacts the feel of the scroll wheel. The wheel should be mounted more securely to prevent this rattle.

With confirmation from Pzogel i have also confirmed that not every unit of the prime+ uses the same scroll wheel encoder. Pzogels unit used a TTC black core encoder to be specific, while both my units used a TTC blue core encoder. I'm unsure why different encoders are used between units but there are multiple reasons Steelseries would do so. There could simply be a supply issue with the black encoders for example, or they might have chosen to swap encoders somewhere after production started because of better feel or durability options. What does worry me however is the possibility that reviewers got the better feeling scroll wheel encoders while the retail units had a cheaper and worse feeling version. I'm very much against swapping out key components on mice (or any product for that matter) unless done after release and solely as an upgrade or to fix a hardware issue. Having different components in the same model can make buying the mouse a gamble like with the razer viper v1 vs v2 optical switches where some units feel significantly worse than others.

Part 4: Features and performance

Cable

The prime series comes with Steelseries "Super Mesh" cable. This cable is extremely stiff out of the box. It's bad enough to feel like a downgrade from the rubber cable on my rival 3 (or even my old Rival 310). Although the cable loosens up a little bit over time it's still not up to par with most competitors cables (Razer's Speedflex cable or the XM1R Flex Cord for example). The cable should definitely be improved to be more flexible, even if that comes at the cost of durability.

Feet

The feet on the prime and prime+ are made of black dyed PTFE. Overall these feel fine and fairly close to some white dyed "pure" PTFE feet on other mice (xtrfy M42 or Endgame gear XM1R for example) however they do feel significantly worse than the actual pure (slightly transparent) white PTFE mouse feet found on the prime wireless. While leaving out this "premium" feature on the regular prime is slightly disappointing yet understandable, leaving it out on the more expensive prime+ feels like an extremely poor cost saving measure that should not have been taken on a premium product. All the prime mice, or at least the prime+, should've come with the undyed white PTFE feet out of the box.

LOD sensor

The LOD sensor on the prime+ is supposed to be a novelty feature that allows the mouse to have a slightly more consistent and lower lift off distance. In practice however the sensor has a very annoying issue. Whenever DPI is changed on the mouse the sensor will recalibrate itself, causing the mouse to stop tracking for about a second. This issue (or feature depending on how

you look at it) was annoying enough for me to feel the need to completely disable the LOD sensor. I personally think the sensor should only recalibrate itself when the LOD is changed.

OLED screen

The OLED screen on the prime+ is a fairly gimmicky feature in its current state. First of all any changes made using the on mouse settings menu will not be synced with Steelseries engine, this causes Steelseries engine to prompt to revert or replace the current profile of the mouse whenever opened if even the smallest change is made (simply changing the dpi for example). For some reason I also received this prompt whenever I restarted my pc or unplugged the mouse. This starts to get pretty annoying when you change your settings (for example lighting) often.

Additionally the lighting settings in the OLED menu are fairly useless. Unlike the DPI setting which allows you to select any DPI up to 18k, the lighting settings only allow you to select one of a few preset colors or a "prism" mode that cycles between colors constantly. RGB values for selecting a color cannot be entered and brightness cannot be adjusted.

Steelseries OLED screens have also historically had issues with burn in. This happened to me on the game DAC and apex pro's OLED screens. Although I cannot confirm if the prime+ suffers from the same issues it seems safe to assume that it would.

Prime wireless sensor

The prime wireless features Steelseries own Truemove Air sensor. From all the testing I've seen, as well as the sensor package and lens, this seems to be a slightly modified version of the PAW3335. Why exactly this sensor was chosen is unknown to me since at the time the PAW3370 was already released and even implemented by multiple competitors. The PAW3335 suffers from a few flaws that either aren't present or are present to a smaller degree in the PAW3370. These flaws include massive and highly inconsistent DPI deviation (not present in PAW3370), large onset motion delay (present in the PAW3370 to a lesser degree), motion delay (not present in PAW3370) and a fairly high lift off distance (lowered to 1-2mm in the PAW3370). Overall I don't understand the choice of a budget sensor in a premium price product and I feel like using a PAW3335 over a PAW3370 is inexcusable even if it has a potentially slightly lower power draw (which should not be significant enough to give up this much performance). The mouse should either be cheaper or higher quality components should be used. The orochi v2 for example has a better performing (no onset motion delay) version of the PAW3335 at a significantly lower price (\$70).

The Truemove Air in the Prime wireless also seems to have no corded (full power) mode implemented at all. All power saving features that are enabled during wireless use are also enabled when the mouse is plugged in, including its motion delay. We have seen in other PAW3335 that, although it can't be removed completely, the onset motion delay on the

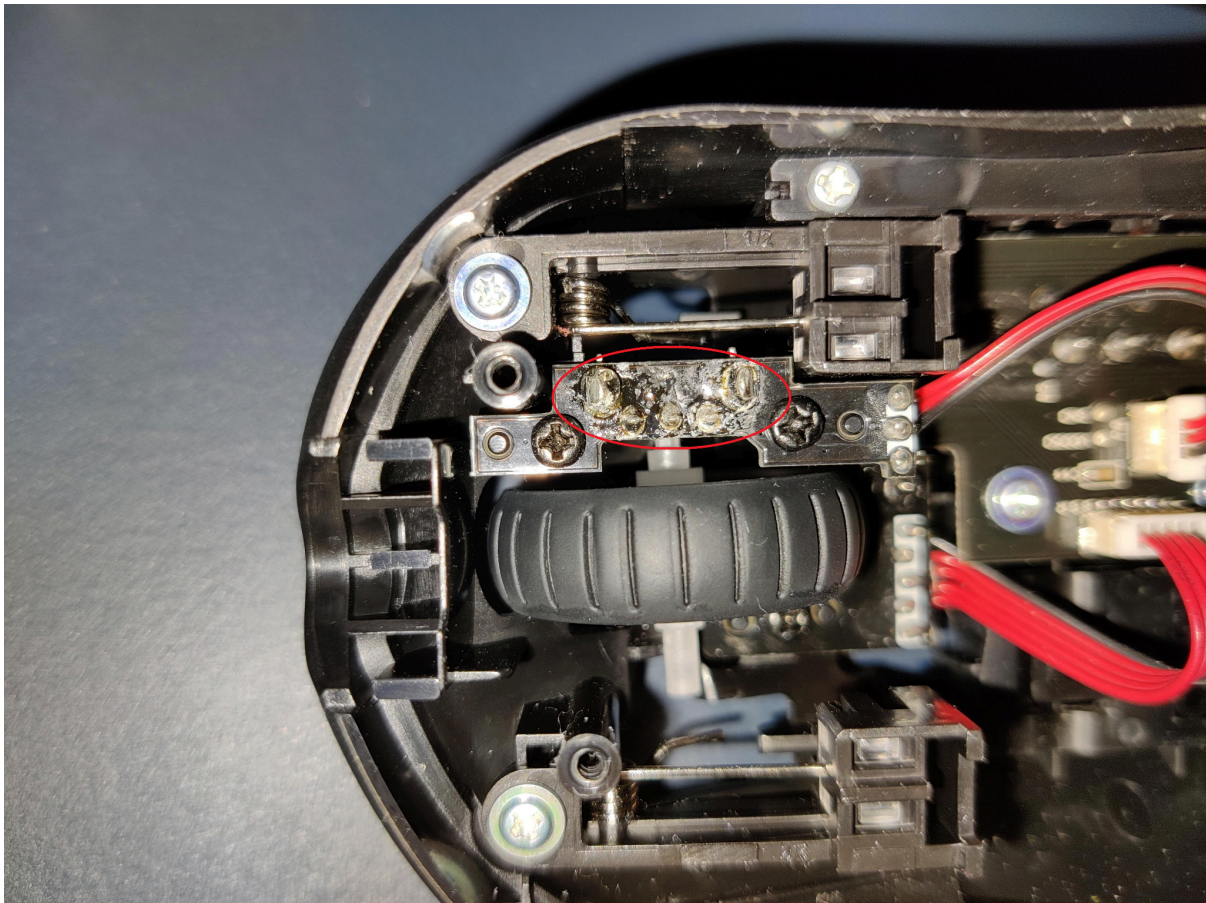
PAW3335 can be drastically reduced when used in wired mode. If possible this should probably be fixed in firmware.

Overall Steelseries has consistently put “cheap” sensors in premium products (PMW3331 equivalent in the \$60 aerox 3, PAW3335 in the aerox 3 wireless and even a PAW3335 over a better performing PMW3389 (truemove pro), PAW3370 or PAW3399/3395 (focus+)in the wired rival 5 where the power saving features of the PAW3335 do not matter, yet are still enabled). This is a trend that needs to stop if they want to be a premium brand.

Part 5: Build quality

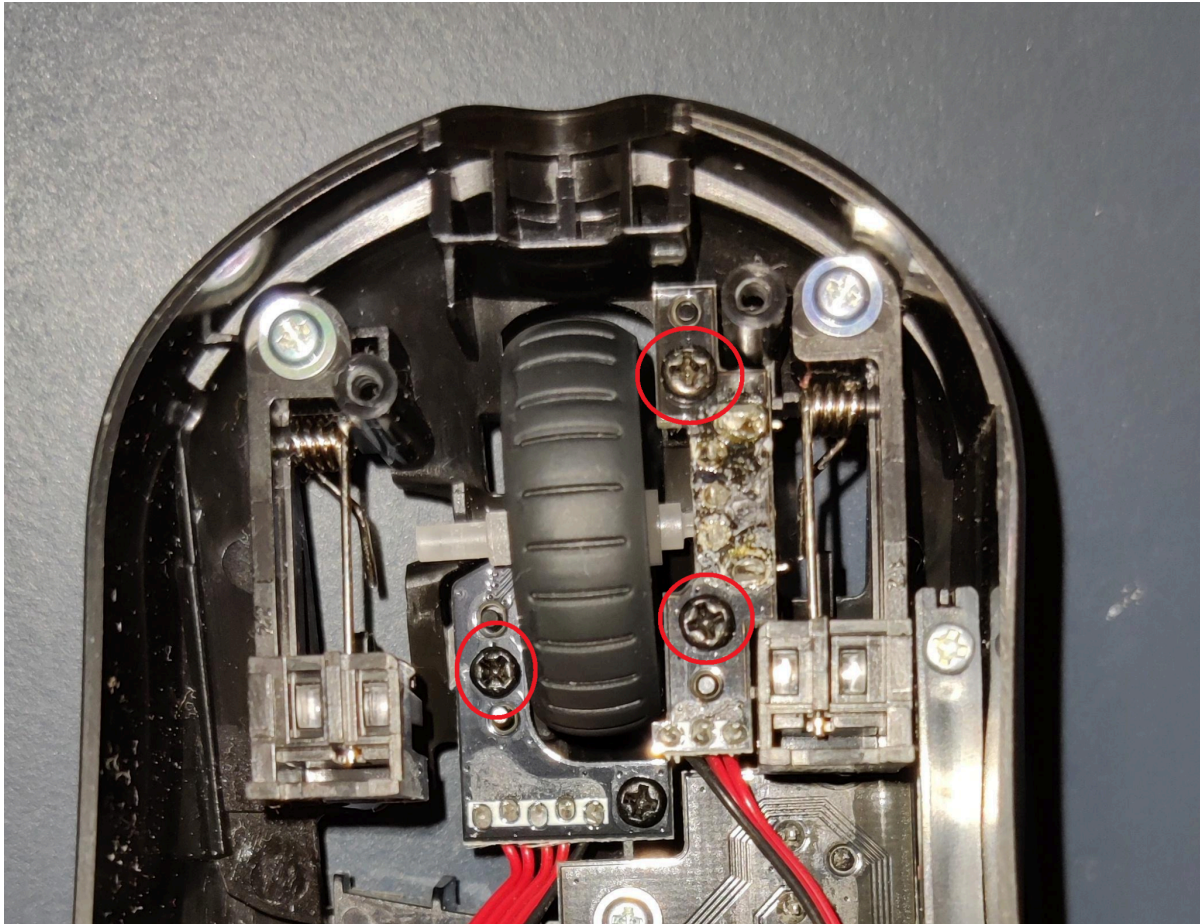
Soldering and PCB

Let me start by saying there were a lot of issues with the soldering and PCB quality on my original unit, so let's start by listing the obvious issues.

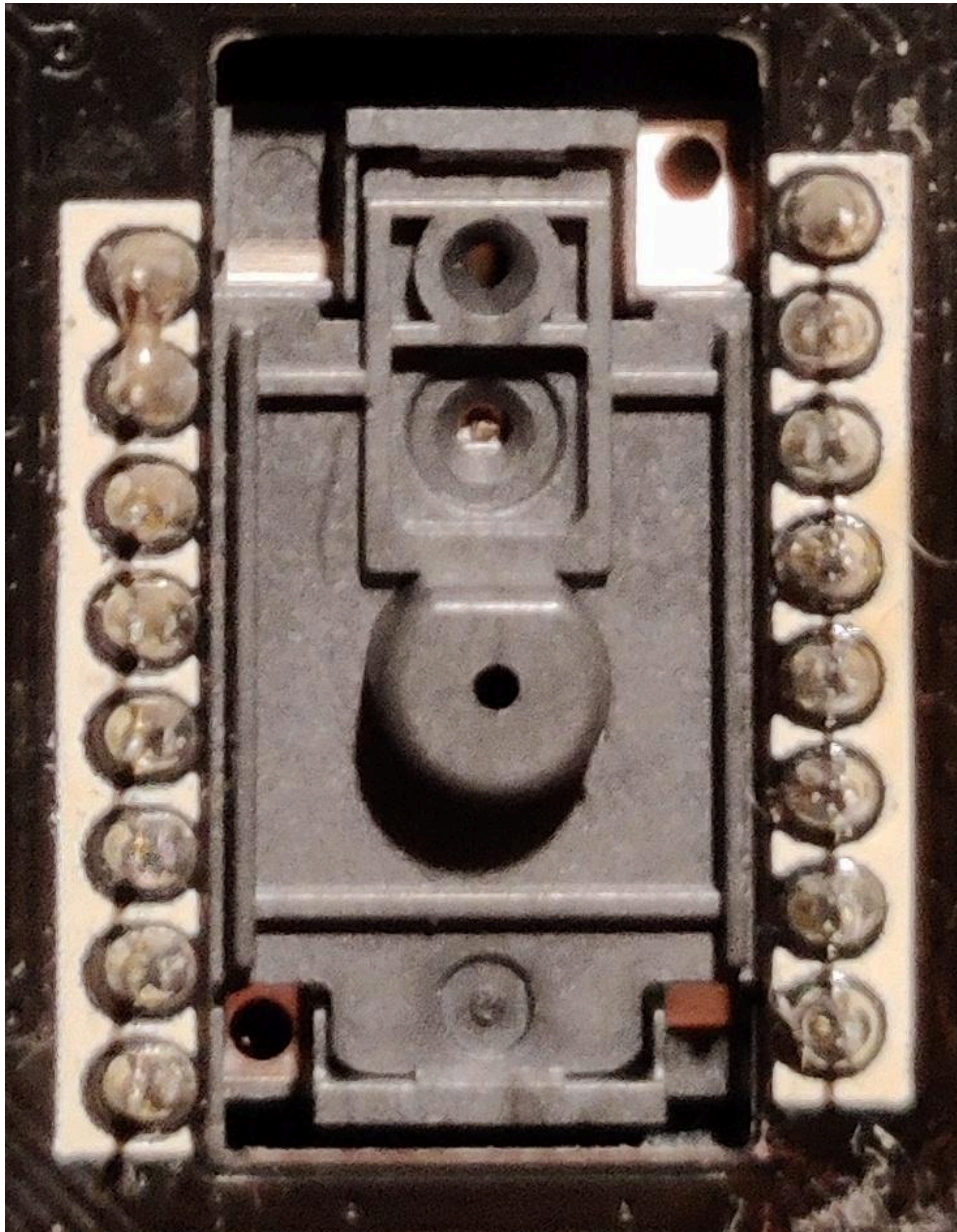


First of all the solder quality around the scroll wheel encoder is clearly unacceptable. The PCB is partially melted and way too much solder is applied. This unit in particular had a scroll wheel

malfunction that appeared after a few days. If this is the general quality we could expect for soldering i wouldn't be surprised if multiple units will end up failing over time.

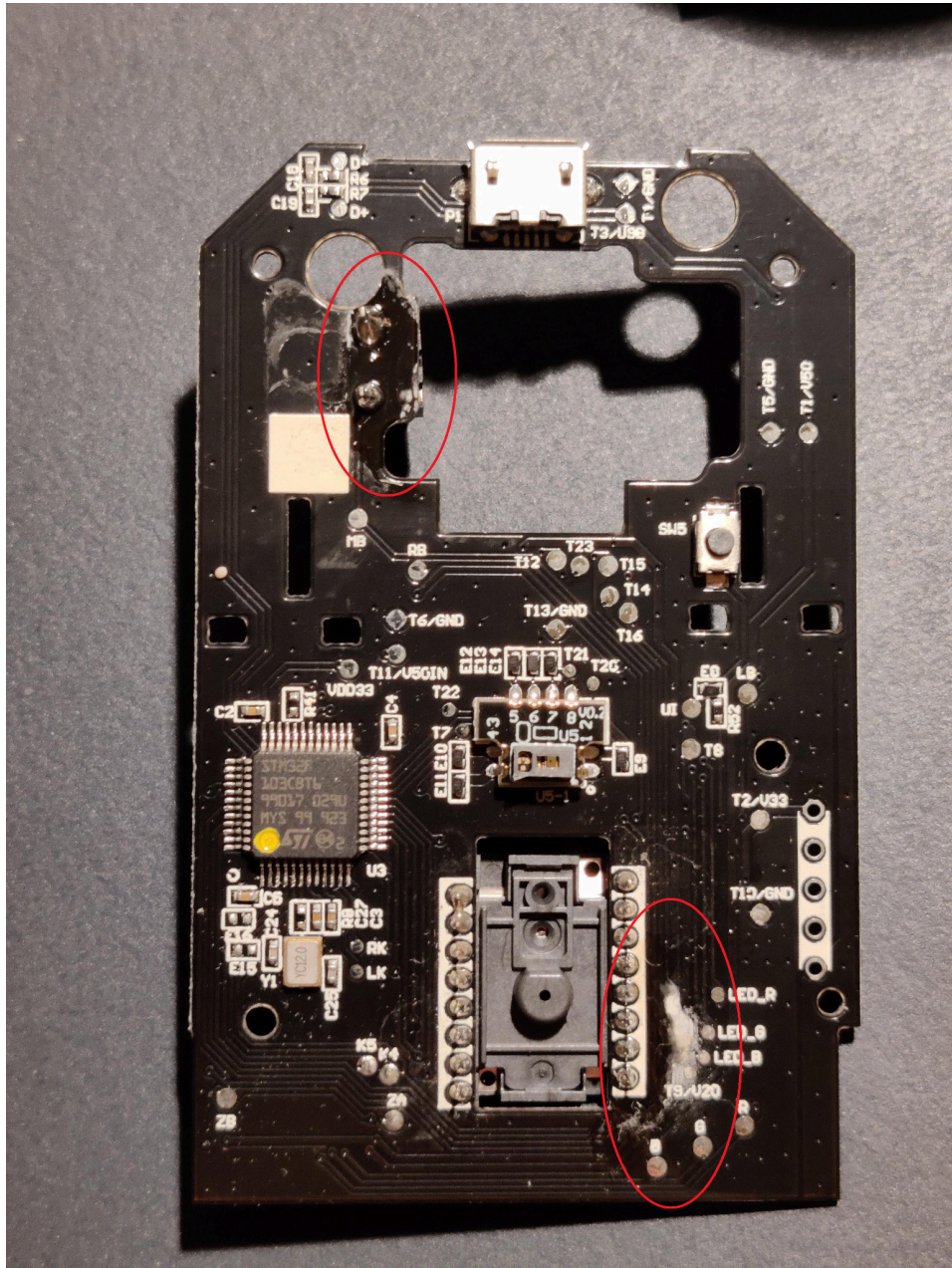


There are also multiple metal screws mounted extremely close to some PCB traces. This could cause failure and in certain cases even pose a fire hazard (see [NZXT H1](#)). Although I doubt there's enough power running through this secondary PCB to cause a fire, malfunctioning could still be an issue.



I don't think much explanation is needed on this image. Clearly 2 solder joints are connected on the sensor. In this case specifically pin 15 and 16 are connected. Assuming the truemove pro uses the same pin layout as the 3360 or 3389, this would mean that a led power pin is connected to a reserved (no connection) pin, therefore not causing issues. If another set of pins were connected this could cause sensor malfunction or could potentially even cause permanent damage to the sensor

All previous issues could be potential fire hazards, especially when a highly flammable battery is used. Although I highly doubt your prime (or any regular usb device) will cause your house to burn down, they might still cause some minor damage.



For some reason the PCB also has large pools of residue on it. Although I don't know for certain what this residue was, it is safe to assume it's either leftover flux or glue from the manufacturing process. In the situation where the residue was leftover flux this could cause failure down the line. Less flux should be used and excess flux should be cleaned from the PCB. Note that pixart specifically warns for the effect flux might have on the sensor package as seen in section 2.6 of their [datasheet](#)

The final issue I have with the PCB assembly is that the sensor lens is not molten in place. Pixart specifically recommends melting the sensor in place in their assembly recommendations (again section 2.6 of their [datasheet](#)). This change would eliminate any potential lens rattle the mouse might have. I therefore recommend this extra additional step is taken during assembly

Feet glue

The glue Steelseries uses for their stock feet does not stick well enough to the bottom of the prime. This causes the mouse feet to bulge out near the center (most notable on the larger bottom foot). This was not a single unit issue as both my prime+ models had bulging stock (black) feet and bulging on Steelseries own pure ptfе (white) replacement feet. For reference this issue didn't occur on 3rd party replacement feet (corepads) and was not present around the sensor ring.

Bottom plate flex

Both units I've owned had fairly large amounts of flexing on the bottom plate. Steelseries support has confirmed that this is "within tolerance" for the prime+. Bottom plate flex was large enough to easily fit a fingernail between the bottom plate and the rest of the shell. By itself this wouldn't be too much of an issue, only occasionally causing some scraping against the mousepad. However, together with the poorly secured sensor lens discussed earlier some slight sensor movement could be observed. Even without the lens movement I feel like this issue should be fixed, simply because it would improve the gliding experience on softer pads, where feet sink in easily.

Serviceability

For some reason the mouse uses torx screws for the bottom plate. I personally don't see a reason to use torx over regular phillips or flathead screws other than keeping customers from opening up their mouse. For mounting of the PCB'd and main buttons regular philips screws are used instead. Using regular philips screws could make it easier for users to mod or repair their mice.

DPI button

The bottom DPI button has an absurd amount of wobble to it and causes moderate rattle when shaking the mouse. A better mount for the DPI button could easily prevent all this. Although not dealbreaking in any way there shouldn't be rattle on a premium priced mouse.

Part 6: Final thoughts

I've been using my prime+ throughout the entirety of writing this document and, although there are flaws with the mouse, I feel like there's definitely some interesting ideas here that could be improved upon. To my knowledge there are no new fixes planned for the prime lineup (from click latency to OLED issues) and I fear that this mouse will unfortunately end up spending the rest of its days laying in a drawer, nearly unused and forgotten. I will now be going back to my XM1R for the time being (or at least until I can get my hands on a wireless version). But maybe, after a while, I'll pick my old prime back up and wield it just one more time.

Thank you for reading.

-Arti Meyer