

HOW REPAIRABLE IS YOUR MOBILE DEVICE?

A PRODUCT GUIDE TO
BEST-SELLING SMARTPHONES,
TABLETS AND LAPTOPS

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METHODOLOGY

This assessment of the repairability of smartphones, tablets and laptops is based on the teardown score from iFixit as well as the availability of repair manuals and spare parts. In sum, this assessment determines whether or not a product is designed with repairability in mind.



iFixit's repairability scores range from 1 (worst) to 10 (best). A device with a perfect score will be relatively inexpensive to repair because it is easy to disassemble and has a service manual available. Points are docked based on the difficulty of opening the device, the types of fasteners found inside, and the complexity involved in replacing major components. Points are awarded for upgradability, use of non-proprietary tools for servicing, and component modularity.

Greenpeace's product scorecards, available at rethink-it.org showcase iFixit's repairability score; the ease of replacing the battery and display; whether special tools are needed; and whether spare parts are available.

In total, 44 best-selling models from 2015 - 2017 were assessed, with 26 purchased by Greenpeace, 10 by the office in China, 7 in Germany and 9 in the USA, with a total of 17 brands represented. This was to ensure that each brand's flagship models were assessed; the remainder were models obtained by iFixit.¹

¹ iFixit is a US-based site that hosts repair manuals to help people fix almost anything and also sells repair tools and spare parts. iFixit also conducts device "teardowns" to assess ease of repair. Detailed teardowns conducted by iFixit engineers can be accessed here:

<https://www.ifixit.com/smartphone-repairability>

<https://www.ifixit.com/tablet-repairability>

<https://www.ifixit.com/laptop-repairability>





OVERALL SUMMARY OF FINDINGS

According to the iFixit ratings, the results show some examples of good practice – as well as some examples of design for obsolescence, where there was no possibility of users replacing commonly failing parts. The smartphones with the best scores are from Fairphone, LG and Xiaomi; best scoring tablets are from HP, LG and Acer; while HP, Dell, Samsung, LG and Acer all make high scoring laptops. Both of the Microsoft products that were tested – a tablet and a laptop – were very low scoring (2 & 1). Other brands with low scoring devices all have other higher scoring products; for example four of the Apple tablets or laptops score only 1 or 2 points but the iPhone 7 scores 7, and while the Samsung smartphones and tablets score 3 or 4 points, its laptop scores 9. There are also examples of brands making recently released devices less repairable than older models, for example, the retrograde design of LG's latest smartphone model, the G6, is much harder to repair than previous models.

Only three of the 17 brands assessed make the provision of spare parts and repair manuals easy to access, (Fairphone, HP and Dell), while at the other end of the scale, Samsung, Apple and Microsoft do not make spare parts or repair manuals easily available to users. There are other examples such as Sony, where spare parts are accessed per model, so the geographical extent of this provision is difficult to assess.

For all devices, the most problematic component for design for repairability is the display, a part which commonly fails in all these types of devices, but which is often designed in a way that makes replacement very costly. Two-thirds of the devices (30 out of the 44) that were tested had displays that were designed to be difficult or costly to replace. The part which most commonly needs replacing is the battery²: the assessment revealed some very good examples (LG's G4 and G5) as well as extremely bad practice (such as the Samsung Galaxy S7, S7 Edge and S8 smartphones). Of the 44 devices tested, only 14 were designed for their batteries to be easily replaced by end users, with two-thirds requiring special tools or removal of adhesives to replace the battery.





In general, the assessment shows enormous potential for improving the reparability of electronic products and for giving users the option to easily and affordably get their devices repaired to extend their lifespans. The good examples show that this is technically achievable and that brands should be prioritising this in their product design and in the provision of their after sales services. Making devices that can be repaired and made to last longer is the most significant step that brands can take to reduce the various environmental impacts associated with electronics manufacturing - from the extraction of virgin raw materials, through to the hazardous chemicals and the large amounts of energy used in manufacturing. Devices that can be easily disassembled for repair are also easier to disassemble for re-use and recycling - the next stage of a product's life - once it is no longer possible to use the whole product anymore. Components can be used again and, if not, recycled to recover the valuable raw materials.

2 "A battery is a feeble vessel that begins to fade the moment it leaves the factory. A battery is also [one of] the most prone parts to fail, requiring several replacements in the life of the host." <http://www.cadex.com/en/batteries/knowing-when-to-replace-a-battery>

01



SMARTPHONES



Three companies have smartphone models scoring 8 points or above with the Fairphone 2 as the clear leader on reparability, scoring maximum points for its user-friendly modular build and availability of spare parts and repair manuals. In a close second, the LG models G4 and G5 score well as their batteries are easy to remove by hand, with a slide-out battery in the G5 model for easy replacement – a progressive feature that has unfortunately been dropped in the new G6 model. One of the two Xiaomi phones tested – the Redmi Note 3 – scores well for its modular design which means many components can be easily replaced. Fairphone provides spare parts for its models as well as a repair guide, while LG and Xiaomi make spare parts difficult to access and do not provide a repair guide.

The majority of models fall in the intermediate category; some aspects of these models show good practice – such as the removable display panel on Apple's iPhone 7 and 7+ or modular design or components in many of the models, notably Huawei, Lenovo and Google. This is countered by some bad examples, particularly where the display unit is welded to the mid-frame, making it difficult if not impossible to replace, overuse of strong adhesive or non-standard screws, making the phones difficult to open or repair.

The worst examples are from Samsung as all three of its smartphones fall in the bottom category, with the new Galaxy S8 scoring 4 points and the two other Galaxy models (S7 and S7 Edge) scoring only 3 points, as the display is extremely difficult to remove, and cannot be separated from its frame without destruction. Among numerous other problems, spare parts or repair guides are not available for any of these models. There is an unfortunate trend for some later models – such as the LG G6 and the Samsung Galaxy S8 – to be less repairable than their predecessors.



IFIXIT SCORES OF 8/10 AND ABOVE

FAIRPHONE 2 10/10 SPARE PARTS/REPAIR GUIDE Y/Y

The Fairphone 2, famous for its modular design, leads with a maximum iFixit score for repairability together with full marks for availability of spare parts and repair manuals. The Fairphone 2 has the most user-friendly battery for replaceability as no tools are needed to open the case to replace the battery or other modular components such as the camera, display or microphone unit.

LG G4 & LG G5 8/10 SPARE PARTS/REPAIR GUIDE N/N

The LG models G4 and G5 also have a modular design and their battery replaceability is on par with the Fairphone 2. The battery is easily removed by hand in both models, with a user-friendly slide-out battery in the LG G5 for easy replacement; LG also provides a video for detaching the battery on the G5³. Unfortunately this progressive design is not being used in the recently released LG G6. LG provides replacement batteries for the G4 and G5 under 'accessories', but does not provide spare parts⁴; although there is an owner's manual there is no repair guide⁵. The other downside for both phones is that the display is not simple to replace.

³ <http://www.lg.com/uk/support/video-tutorials/CT00008356-20150157762032-others>

⁴ LG spare parts website sites are linked under "parts and accessories" in most regional LGE websites, apart from the Korean website, and either appear in the same browser (USA, MX), or take the user to another website with a different URL (UK, Canada, Germany). For Korea, there is a dedicated website for spare parts but there is no link from the main LGE website.

For example:

Type1 (same browser): USA: <http://www.lg.com/us/support/parts-accessories>

Type1 (same browser) MX: <http://www.lg.com/mx/soporte/accesorios/venta>

Type2 (link to different url): UK: <http://www.4lg.co.uk/>

Type2 (link to different url):

Canada: <http://www.lgcanadaparts.com/?gclid=COSc5PToidQCFvkEKgoduLQKIQ>

Type2 (link to different url): Germany: <https://shop.euras.com/default.php?g7=1292104N>

Type3 (no link, separate website): Korea: <https://www.lgservice.co.kr/shop/selectShopMain.do>

For mobiles, tablets and computers, in general only accessories such as batteries or battery cover cases are sold on these websites; batteries for the G4 and G5 are available.

⁵ Since 2012, LG has provided a help library and video tutorial to support consumers who face problems with their gadgets, but no repair manuals are provided.





XIAOMI REDMI NOTE 3 - 8/10 SPARE PARTS/REPAIR GUIDE N/N

The Xiaomi Redmi Note 3, one of two Xiaomi models tested, has an iFixit score of 8 but has no availability of spare parts⁶, or repair manual. The rear case is easy to remove and the battery is also easy to access and remove. The Redmi Note 3 has modular design with a charging port on its own motherboard which means many components can be easily replaced. The downside is that the display assembly is a single fused component that requires disassembling the entire phone to replace.

IFIXIT SCORES OF BETWEEN 5/10 AND 7/10

APPLE IPHONE 7 7/10: SPARE PARTS/REPAIR GUIDE N/N

Both of Apple's products, the iPhone 7 and 7+ have an iFixit score of 7 but lack availability of spare parts and repair manuals. Apple has improved the replaceability of the battery compared to previous models (iPhone 4 & 5 for example) but speciality tools and knowledge on how to remove adhesives are still needed to remove it. Apple has also improved the replaceability of the display, which is the first component to be accessed during disassembly.

HUAWEI P9 7/10 & HUAWEI MATE 8 6/10: SPARE PARTS/REPAIR GUIDE N/N

The two Huawei's models P9 and Mate 8 score 7 and 6 respectively, despite modular components and some thoughtful design. According to iFixit, the P9's battery is not replaceable without knowledge of adhesive removing technique. Special tools are needed to open the P9 and stickers need to be removed to access the battery in the Mate8. The displays on both phones are difficult to replace, with the P9 needing to be almost completely dismantled, and specialist tools are needed to open the phone in the first place. Spare parts are not available and there is no repair guide.

⁶ Xiaomi has no official channel to purchase spare parts in China, and although these are available on a global community website <https://xiaomi-mi.com/mi-spare-parts/>, information and service are not provided consistently in different geographies.



VIVO X7 6/10 & VIVO X7 PLUS 7/10: SPARE PARTS/REPAIR GUIDE N/N

The Vivo X7 and X7+ have iFixit scores of 6 and 7 respectively. Vivo also does not make spare parts or repair manuals available to allow users to arrange their own repair, but does offer a free repair service for customers, who need to pay for spare parts. The batteries in both models are fairly easily accessible and removable. However, the parts could be more modular, especially mechanical/high wear parts and the opening procedure is very tough, particularly for the X7. On both phones there is a single unit display which is difficult to reach and would be a costly part to replace.

LENOVO MOTO Z 7/10, LENOVO K5 NOTE 6/10: SPARE PARTS/REPAIR GUIDE N/N

The Lenovo smartphones – the Moto Z and K5 Note – earn an iFixit score of 7 and 6 respectively, although there is no availability of spare parts or repair manuals. The pull tab battery of the Moto Z is easy to access once the device has been opened; its modular assembly allows independent replacement of components and the display is easily separated after heating the weak adhesive. However, the charging port is soldered to the motherboard making repair expensive. The battery in the K5 Note is replaceable with just a couple of standard tools; while some parts are modular, high wear components such as the headphone jack and charge port are not. There is sparing use of adhesive, however, the display assembly, which is a part which commonly fails and needs replacing, is the last component reached, making it difficult to replace.

OPPO R9M 7/10: SPARE PARTS/REPAIR GUIDE N/N

The Oppo R9m has a score of 7 from iFixit but Oppo does not make spare parts or repair manuals available. The battery in the R9 is fairly accessible and removable and most components are very modular. However, opening the phone is not easy and there is single unit display which is difficult to reach and would be a costly part to replace.

ASUS ZENFONE 3 MAX 6/10: SPARE PARTS/REPAIR GUIDE N/N

Only one phone from Asus was tested: the ZenFone 3 Max which has an iFixit score of 6 and no availability of spare parts or repair modules although spare parts are offered as part of its repair service. While the battery is easily accessible and removable, parts could be more modular, especially high wear/



mechanical parts. Opening the device is extremely tough, it is held together with stiff clips which are likely to break and the SIM port bends easily. There is a single unit display which is difficult to reach and would be a costly part to replace.

SONY XPERIA Z5 COMPACT 6/10: SPARE PARTS/REPAIR GUIDE Y(UNCLEAR AVAILABILITY)/N

One phone from Sony was tested; the Xperia Z5 compact which has an iFixit score of 6: spare parts may be available through a partner company, at least in EU, but there is no availability of repair manuals. The Xperia has a modular design which allows for the replacement of many individual parts; the battery is fairly easy to access and remove, but requires the removal of delicate NFC antenna in order to replace. Adhesive is used throughout which would need to be replaced during reassembly; water resistance is likely to be lost. The fused display assembly is strongly adhered to the mid-frame and requires disassembling the entire phone to replace.

XIAOMI MI 5 6/10: SPARE PARTS/REPAIR GUIDE N/N

The Xiaomi Mi5 has an iFixit score of 6. Spare parts are not available to purchase⁷ and there is no repair manual; a repair service is available which includes spare parts. Most components are modular and can be replaced independently, for example, the motherboard and display; all screws are standard Phillips; however, the display is difficult to replace.

GOOGLE PIXEL XL 7/10: SPARE PARTS/REPAIR GUIDE N/N

Google's Pixel XL has many modular components that can easily be replaced once the display is removed; however it has an iFixit score of 7 and lacks availability of spare parts and a repair manual. Its battery is fixed with a modest amount of adhesive making it relatively easy to remove using the removal tab, however, it is difficult to open the phone without damage and dismantling the phone for repairs is laborious due to snug, press-fit notches.

⁷ Xiaomi, op.cit.



LG G6

5/10: SPARE PARTS/REPAIR GUIDE N/N

The progressive design for the LG G4 & G5 (see above), where the battery slides out easily, is unfortunately not replicated in the LG G6, which has an iFixit score of 5/10. The battery can be replaced, but tough adhesive and a glued-on rear panel make it unnecessarily difficult. Strong adhesive on the front and back glass makes it difficult to open the phone to begin repair or replace parts. Having glass on the front and the back doubles the chances of cracking, while components are stuck to the back of a fused display assembly. For spare parts, LG also does not currently provide replacement batteries and in general only “accessories” such as chargers are available for mobiles on its ‘parts’ websites⁸; although there is an owner’s manual there is no repair guide. Nevertheless, many components are modular and can be replaced independently, while standard Phillips screws are used, very sparingly, throughout.

IFIXIT SCORES OF 4/10 AND BELOW

SAMSUNG GALAXY S8

4/10: SPARE PARTS/REPAIR GUIDE N/N

The new Samsung Galaxy S8, Samsung’s major offering since the notorious Note 7, makes no major improvements from the point of view of reparability, scoring only 4/10 from iFixit. Like other products from Samsung, no repair guide is available, and although Samsung has a spare parts website, batteries are not available for recent models of smartphones⁹. The front and back glass look iconic but mean that both sides of the phone are subject to cracking. Because of the curved screen, replacing the front glass without destroying the display is extremely difficult. Accessing the phone to repair or replace parts is very difficult as the front and back are glued on with strong adhesive. This means that although the battery can be replaced, the tough adhesive and a glued-on rear panel make it unnecessarily difficult. However, once inside the phone, there are lots of components which are modular and can be replaced independently.

⁸ Footnote 3, op. cit.





SAMSUNG GALAXY S7 3/10 & GALAXY S7 EDGE 3/10: SPARE PARTS/REPAIR GUIDE N/N

Samsung's Galaxy S7 and Galaxy S7 Edge both score poorly in iFixit's ratings. Additionally there is no availability of repair manuals and although Samsung has a spare parts website, batteries are not available for recent models of smartphones. While many components are modular and can be replaced independently, replacing the battery is also made more difficult than necessary with tough adhesive and a glued-on rear panel. To replace the USB port the display needs to be removed (and likely destroyed in the process). Front and back glass makes for double the crackability and strong adhesive on the rear glass makes it difficult to gain entry to the device; replacing the glass without destroying the display is impossible.

9 Samsung has a spare parts website <http://www.samsungparts.com/Default.aspx>

However, "Cell phone accessories":

<http://www.samsungparts.com/PartsList.aspx?PartType=MOBILE>

include spare batteries only for the following models: Note 2, Note 3, Note 4, Galaxy Note S5, Galaxy S4, Galaxy S3, Galaxy S5 and Galaxy S6 Edge; no spare batteries are available for more recent models of smartphone.

02



TABLETS





Among the fifteen tablets assessed, the five high scorers are led by the HP Elite x 2, which scores maximum points on all criteria. In general, however, the bar has been set lower for tablets as OEMs tend to design tablets to be less repairable and more disposable than smartphones or laptops, a problem that needs to be addressed in future designs, with the inclusion of a swappable RAM, for example. Other brands with high scoring models are Acer, Amazon, Asus, and LG, all scoring 8 on repairability from iFixit, although Acer and Amazon do not make spare parts available and LG makes spare parts difficult to access. The majority of tablet models score in the middle category and are made by Amazon, HP, Huawei (2 models) and Sony, all of which have an iFixit score of 7, apart from the Sony Xperia Z4, which scores 5. HP and Huawei at least provide spare parts (and are the only two companies with clear information on this), while Sony directs users to local dealers. Three companies fall in the bottom category – Apple (2 models), Google (1 model) and with the lowest iFixit score of 1, the Microsoft Surface Pro 5.

None of these companies supply spare parts or repair manuals and all make access to components difficult with strong adhesive and other designs that are not user-friendly for the purpose of repair.

Overall, only three tablets tested had easily replaceable batteries, and only four of the models have replaceable displays – both HP models and the Acer Iconia One tablet.



IFIXIT SCORES OF 8 AND ABOVE

HP ELITE X2 1012 G1

10/10: SPARE PARTS/REPAIR GUIDE Y/Y

The HP Elite x2 1012 G1 scores maximum points from iFixit; in addition there is availability of spare parts and a repair guide. Apart from a minor amount of tape over the sensor array, there is no adhesive; all screws are standard and a modular and flat overall construction allows access to most components without a lengthy disassembly process. The easy access to HP repair documentation and replacement parts makes self-repair more feasible. The flash storage is a standard M.2 card and can be easily upgraded or replaced. The display is fused to the front panel, making it easy to disassemble but increasing the cost of an LCD or front glass replacement. To date, there are no examples of tablet PCs with a swappable RAM, and this model is no exception, with the RAM soldered to the motherboard. Future designs need to address this, but HP hasn't been penalised by iFixit in this assessment.

ACER ICONIA ONE

8/10: SPARE PARTS/REPAIR GUIDE N/N

Acer's Iconia One has an iFixit score of 8 for repairability, although spare parts and repair manual are not available. The LCD & front glass are not fused together and can be replaced individually; the battery is easy to replace and the modular design allows replacement of many individual parts, with standard Phillips screws used throughout. The downsides are that high wear components are soldered in place, increasing replacement costs and there is no user-accessible repair documentation.

AMAZON KINDLE PAPERWHITE (7TH GEN)

8/10: SPARE PARTS/REPAIR GUIDE N/N

The Kindle Paperwhite by Amazon score 8 points from iFixit for repairability, although spare parts and a repair manual are not available. The battery is very easy to remove once inside, as all screws are standard Phillips and all components likely to need replacement are modular, apart from the USB port. However, there was a thin layer of adhesive which needed breaking to remove bezel and access internal components.





ASUS ZENPAD 3S 10

8/10: SPARE PARTS/REPAIR GUIDE N/N

The ZenPad 3S 10 tablet by Asus earns 8 points for repairability, although spare parts and a repair manual are not available. The device is fairly easy to open, however the battery is tricky to access behind two cables. Additionally, the display is challenging to replace as the entire device must be disassembled to access it. On the plus side, only standard tools are needed for repairs and many components, including the cameras, speakers, volume buttons, charging port board, and microSD reader, are modular and easy to replace.

LG G PAD 7.0

8/10: SPARE PARTS/REPAIR GUIDE N/N

LG's G Pad 7.0 scores 8 for repairability, although LG does not make spare parts available apart from accessories, it is unclear if even spare batteries are available for this model¹⁰; in addition there is no repair manual and although LG does offer a repair service. The very modular design of the G Pad 7.0 allows for the independent replacement of several wear-prone components, such as the headphone jack and speakers. The battery is held in place with very mild adhesive making it fairly easy to safely remove and replace, while there are only 10 standard Phillips screws in the entire device. However, the display assembly is a single fused component that requires disassembly of the entire device to replace.

IFIXIT SCORES OF BETWEEN 5/10 AND 7/10

HP ELITEPAD 1000 G2

7/10: SPARE PARTS/REPAIR GUIDE Y/Y

The HP ElitePad 1000 G2 scores 7 because its RAM & SSD are soldered to the motherboard and non-upgradeable; the previous generation had an easily removable Display with no adhesive. However, HP provides spare parts and a repair guide. In addition, most commonly failing components including all ports and buttons are modular and can be replaced quickly. The battery can also be removed relatively quickly but it is covered in tape that needs replacing.

¹⁰ Footnote 3, op. cit.





HUAWEI MEDIAPAD M2 10.0 - 7/10 AND HUAWEI MEDIAPAD T2 7.0 PRO - 6/10: SPARE PARTS/REPAIR GUIDE N/N

Both the Huawei MediaPad M2 10.0 and the T2 7.0 are graded by iFixit as 7 and 6 respectively. Spare parts are not available and there is no repair guide. In both tablets, the charging port is soldered to the motherboard making replacement expensive. The display of the M2 10.0 is easily removed from body by simple clips, simplifying repairs and most components are modular. However, the battery is extremely difficult to remove even with heat and prying. The rear case of the T2 7.0 is secured by clips rather than glue, and is flexible enough to remove fairly easily; standard Phillips screws are used throughout. However, the battery is held in place with excessive adhesive and a hole in the mid-frame means prying out battery risks damaging the back of the display.

AMAZON FIRE TABLET (5G) 7/10: SPARE PARTS/REPAIR GUIDE N/N

Amazon's Fire tablet scores 7 from iFixit for repairability and has no availability of spare parts or a repair guide. The plastic case assembly is held together by clips; although there is no glue, opening it requires prying out with iFixit tool. Positives are that the digitizer and LCD panel not fused together and all screws are standard Phillips. However, while the battery is modular it is held in place by stubborn adhesive; removing the digitizer and LCD panel also requires fighting through some very resilient adhesive.

SONY XPERIA Z4 5/10: SPARE PARTS/REPAIR GUIDE Y(UNCLEAR AVAILABILITY)/N

Sony's Xperia Z4 has an iFixit repairability score of 5, while the availability of spare parts is unclear and no repair guide is provided (Sony's website directs the user to an approved dealer for spare parts). The main problem is that the display assembly consists of a thin fused glass panel and LCD and is extremely difficult to remove and replace. The delicate and arduous opening procedure leaves no room for mistakes and must be completed to access any of the other components. Battery adhesive tabs are present but tear easily and may not be accessible in some units. On the plus side, many parts are modular and can be replaced independently and all screws are standard Phillips.





IFIXIT SCORES OF 4 AND UNDER

SAMSUNG GALAXY TAB S3 – 4/10: SPARE PARTS/REPAIR GUIDE N/N

There is no availability of spare parts or repair manuals for the Samsung's Galaxy Tab S3 and iFixit's rating is only 4/10, mainly because of the large amounts of adhesive used to secure the front and rear panel in place. This makes them very difficult to remove, which is essential to do in order to replace any parts. Accessing the battery is therefore not easy, but once this is achieved it is just held in place by screws. Other positive aspects are that many of the components are modular and can be replaced, such as the headphone jack, speakers, and microSD slot, and all screws are standard Phillips screws.

APPLE IPAD PRO 9.7" 2/10: SPARE PARTS/REPAIR GUIDE N/N

Apple's iPad Pro 9.7 only scores 2 for repairability and has no spare parts or repair guide available. The battery is very solidly adhered, without any pull tabs to assist as in the larger iPad Pro 12.9. The smart connector port is virtually impossible to replace, but it incorporates no moving parts and is unlikely to fail. The LCD and front panel glass are fused together, slightly simplifying the opening procedure. The fused front panel increases the cost of screen repair and the risk of damaging the LCD when opening; everything is held in place by adhesive, making repairs difficult.

APPLE IPAD 5 2/10, SPARE PARTS/REPAIR GUIDE N/N

Apple has not made any notable improvements on repairability in the new iPad 5, which scores only 2/10 from iFixit. Like all Apple products there is no repair guide and no availability of spare parts. The front panel is glued to the rest of the device, greatly increasing the chances of cracking the glass during a repair, similar to previous iPads. Everything is held in place with plenty of adhesive and like its Air 1 predecessor, removing the battery is among the most difficult battery removal procedures for an iPad, although the battery is not soldered to the logic board. The LCD has foam sticky tape adhering it to the front panel, increasing chances of it being shattered during disassembly; the front panel's connector can't be accessed until the LCD is removed. Once the front panel is separated from the iPad, the LCD is easy to remove; both the LCD and digitizer are unused and can be replaced separately.



TABLETS



GOOGLE PIXEL C 4/10: SPARE PARTS/REPAIR GUIDE N/N

Google's Pixel C tablet has an iFixit score of 4, and there is no availability of spare parts or a repair guide. While many parts in the Pixel C are modular and can be replaced independently, including the USB- Type C port, the motherboard is glued tightly to the rear case. Replacing the battery is difficult due to strong adhesive which attaches it to the rear case and the fused display must be removed to access any interior parts – no easy task thanks to tough adhesive.

MS SURFACE PRO 5 1/10: SPARE PARTS/REPAIR GUIDE N/N

Microsoft's Surface Pro 5 scores 1 points from iFixit, the lowest of all the tablets tested; and no spare parts or repair guide are available. The solid-state drive (SSD) is no longer replaceable and the battery has a very strong adhesive that makes removal and replacement a hazardous chore. Non-standard connectors also make for tricky display removal. The display removal procedure, while difficult, and required for any repair, is not as hard as in previous generations, due to less stubborn adhesive. The display assembly consists of a fused glass panel and LCD, and is difficult to remove and replace. Adhesive holds many components in place, including the display and battery.



03



LAPTOPS



Assessments of nine laptops provide the greatest number of high scoring devices with 5 examples; only one product scores in the middle category and two are low scorers. Six out of the nine models tested by iFixit have both replaceable batteries and replaceable displays. Laptops from Dell (the Latitude E5270) and HP (the Elitebook 840 G3) both score maximum points from iFixit and with both companies also providing spare parts and repair guides, they are the clear leaders. Devices by LG, Samsung and Acer also do well but do not have repair guides or spare parts available, and although LG spare parts are available these are difficult to access. Another model from Dell (the XPS 13) fails to make the top category due to a soldered RAM which makes it impossible to upgrade; without this problem its score would improve. In contrast, the three laptops in the lowest category – by Microsoft (Surface Book) and Apple (MacBook Pro 13" Touch Bar 2017 and Retina MacBook 2017) – score the lowest possible mark from iFixit of 1, with all models using heavy glue to hold components in place among many other problems. In addition, both companies make no spare parts or repair manuals available.

Clearly, customers expect laptops to have a longer lifespan than smartphones and tablets, so most companies are designing these products with repairability and upgradeability in mind. For laptops iFixit also considered upgradeability in its teardown assessments, an important feature for extending the lifetime of electronic products.





IFIXIT SCORES OF 8 AND ABOVE

DELL LATITUDE E5270

10/10: SPARE PARTS/REPAIR GUIDE Y/Y

The Dell Latitude E5270 scores maximum points for repairability from iFixit, along with HP EliteBook, and has availability of spare parts and repair manuals. All parts that commonly fail (such as the battery, trackpad buttons, display, keyboard) as well as parts that are upgradeable (the RAM and SSD) are easy to access and replace. Minimal adhesive is used throughout, while all fasteners are standard Phillips screws. The overall construction is slightly complicated but Dell provides clear disassembly and repair instructions.

HP ELITEBOOK 840 G3

10/10: SPARE PARTS/REPAIR GUIDE Y/Y

HP's EliteBook 840 G3 shares the top spot with the Dell Latitude E5270 with maximum points from iFixit and has full availability of spare parts and repair manuals. The RAM, SSD and battery are all easily accessible and removable. In addition there is a spare hard disk slot for memory expansion, and the computer is upgradeable in addition to being repairable. All moving parts, including the keyboard, trackpad and pointing stick are modular and can be quickly replaced. The display is immediately replaceable without any unnecessary disassembly and all screws are standard Phillips. Repair documentation is also provided by manufacturer.

LG GRAM 15"

9/10: SPARE PARTS/REPAIR GUIDE N/N

The LG Gram 15" laptop has an iFixit score of 9. Although LG makes spare parts (described as "accessories") such as batteries and chargers available for many of its electronic products, computer accessories are not accessible from many websites and other spare parts are not available¹¹. In addition no repair manual is provided. Most components are immediately accessible after removing the lower case cover; the RAM & SSD are replaceable by the user and parts for upgrades are readily accessible. The battery can also be replaced by the user and only Phillips screws are used throughout.

11 Footnote 3, op. cit.



SAMSUNG NOTEBOOK SERIES 9 15" – 9/10: SPARE PARTS/REPAIR GUIDE N/N

Samsung's Series 9 15" notebook scores 9 from iFixit: however, Samsung does not make spare parts available or provide a repair manual. The notebook is constructed using all Phillips screws; the RAM, SSD and battery are easily replaced. The relatively flat, modular design means that most components can be quickly replaced without having to remove other obstructions. A moderate amount of adhesive on a circuit board and trackpad brackets complicates some reassembly procedures.

ACER PREDATOR 17.3" 8/10: SPARE PARTS/REPAIR GUIDE N/N

The Predator 17.3" from Acer scores 8 from iFixit, although there is no availability of spare parts and no repair manual is provided. A single latch releases the optical drive, so no glue is needed. A single panel gives access to SSD, HDD and 2 RAM slots; Phillips screws are used throughout and there is minimal use of glue. Removing the bottom case takes a little patience but gives access to battery, wi-fi card, CMOS battery, touchpad, speakers and fans. The main downside is that the keyboard is not readily serviceable.

IFIXIT SCORES OF BETWEEN 5 AND 7

DELL XPS 13 7/10: SPARE PARTS/REPAIR GUIDE Y/Y

The Dell XPS 13 has a service manual online and spare parts are available, but only scores 7 from iFixit because the soldered RAM makes it impossible to upgrade when the laptop slows down. Apart from this, removing the back cover is straightforward and all parts are easily replaceable. Screws and connectors are labelled, aiding reassembly; the display assembly is held in by screws and is easy to remove. Elsewhere only moderate adhesive is used with no heat required to remove components. The layering could be improved to make certain components easier to remove, but the modular design makes repairs cheaper.





IFIXIT SCORES OF 4 AND UNDER

APPLE MACBOOK PRO 13" TOUCH BAR 2017- 1/10; APPLE RETINA MACBOOK 2017 - 1/10: SPARE PARTS/REPAIR GUIDE N/N

Apple has two laptops in this category, both scoring the lowest iFixit rating of 1; none have spare parts available or repair guides. The MacBook Pro 13" Touch Bar has proprietary screws which make opening the device unnecessarily difficult. The battery assembly is entirely and solidly glued into the case, making replacement complicated. The processor, RAM, and flash memory are also soldered to the logic board which the addition of the Touch Bar adds a second, difficult to replace, screen to damage. The Touch ID sensor doubles as the power switch; fixing a broken power switch may require help from Apple, or a new logic board. On the positive side, the trackpad can be removed without first removing the battery.

For the 2017 version of the Retina Macbook Apple continues to use standard Phillips screws in place of its proprietary tri-point screws. However, the processor, RAM, and flash memory are soldered to the logic board. The battery assembly remains entirely, and very solidly, glued into the lower case. Finally the Retina display is a fused unit with no separate, protective glass, making replacement extremely costly.

MS SURFACE BOOK 1/10: SPARE PARTS/REPAIR GUIDE N/N

The Microsoft Surface Book scores only one point from iFixit, and no repair guide or spare parts are available. The procedure for opening the MS Surface Book is difficult, but once this is done the SSD can be replaced, as well as the glued battery in the display. However, the base battery is very heavily glued down. The display assembly consists of a fused glass panel and LCD, and is difficult to remove and replace. The processor and RAM are soldered to the motherboard. Strong adhesive holds many components in place, including the display, base cover, and both batteries. Many components are on the backs of their respective boards, requiring motherboard removal to replace simple components.



GLOSSARY

CMOS BATTERY

"complementary metal-oxide-semiconductor" battery

HHD

Hybrid Hard Drive

LCD

Liquid Crystal Display

M.2 CARD

a standard that replaces the mSATA standard solid-state storage applications

MICRO SD SLOT

micro Secure Digital

PCIe

PCI express - a high-speed hardware interface from Intel for connecting peripheral devices

RAM

Random Access Memory

SIM

Subscriber Identity/Identification Module (SIM card)

SSD

Solid State Drive

T5 TORX

Standard screws, Torx is trademark for a type of screw head characterized by a 6-point star-shaped pattern

USB

Universal Serial Bus





LEGEND FOR PRODUCT GUIDE WEBSITE (WWW.RETHINK-IT.ORG)

BATTERY REPLACEABILITY

 (yes): This device can be opened easily and the battery can be replaced by the everyday user. This means the battery is accessible, modular, easily removed without the use of proprietary tools, heat, or advanced techniques.

 (no): The battery in this device is not easily replaced by the everyday user.



DISPLAY REPLACEABILITY

 (yes): Replacing the display for this device requires some skill, but can be done in a relatively short amount of time.

 (no): Replacing the display for this device requires a great deal of technical expertise and time.

NO SPECIAL TOOLS NEEDED

 (yes): Repairing this device requires no proprietary tools. It may require standard tools, such as Philips screwdriver, Torx screwdriver, or tweezers; as well as “repair hack” tools like opening pick, plastic card, spudger, suction cups, or the iSclack.

 (no): Repairing this device requires the use of heat or proprietary tools not readily available to everyday consumers such as pentalobe screwdrivers, tri-point screwdrivers, or other tools to work with tamper-resistant screws.

SPARE PARTS AVAILABLE

 (yes): Replacement parts for this device are available by the original manufacturer to consumers anywhere in the world.

 (no): Replacement parts for this device are not provided by the original manufacturer, or are not provided in all regions.



The logo consists of the word "GREENPEACE" in a white, bold, sans-serif font. The letters are slightly irregular and hand-drawn in style. The background is a solid dark blue, with a light teal geometric shape on the left side that forms a large, abstract arrow pointing towards the right.

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