



Stay productive with a rugged device that's:



Resistant to weather extremes



Resistant to multiple drops



Resistant to heavy rain



Readable in bright sunlight

## The Dell Latitude 7220 Rugged Extreme Tablet brings many advantages to skilled labor use cases

vs. three consumer-grade tablets with rugged cases

Tablets that can't withstand the day-to-day adversities of challenging work environments can result in downtime and lost data. You might feel that putting a premium rugged case on a consumer-grade tablet will keep it safe—but what if you could improve your work experience by investing in a Dell™ Latitude™ 7220 Rugged Extreme Tablet instead?

To find out, we equipped Apple® iPad Pro® 11-inch, Samsung Galaxy Tab S7+, and Microsoft Surface Pro 8 tablets with top-rated rugged cases to protect them from damage. Then, we put the Dell Latitude 7220 Rugged Extreme Tablet and those three tablets through durability tests that measured performance in extreme temperatures, multiple drops, and heavy rain conditions. We also measured screen brightness for outdoor viewability.

We found that extreme temperatures had less effect on the Geekbench 5 CPU performance results of the Dell Latitude 7220 Rugged Extreme Tablet compared to those of the consumer-grade devices we tested. It also did better in several of our other day-to-day durability comparisons.

## How we tested

### Dell Latitude 7220 Rugged Extreme Tablet

- Starting price as of May 12, 2022: \$2,009.00<sup>1</sup>
- Our test tablet cost (peripherals included): \$3,123.55
- Powered by an Intel® Core™ i5-8365U processor
- Windows 10 Pro OS provides a full-featured, computer-like experience with Microsoft 365 desktop or online apps<sup>2</sup>

### Apple iPad Pro 11-inch

- Starting price as of May 12, 2022: \$799.00<sup>3</sup>
- Our test tablet, OtterBox® Defender Pro rugged case, and Apple Pencil cost: \$1,317.95
- Powered by an Apple M1 chip
- Apple iPadOS® OS delivers a limited-feature, smartphone-like experience with Microsoft 365 mobile apps<sup>4</sup>

### Samsung Galaxy Tab S7+

- Starting price as of May 12, 2022: \$549.99<sup>5</sup>
- Our test tablet, SaharaCase® rugged case, and Samsung S Pen cost: \$818.98
- Powered by a Qualcomm® SDM865+ processor
- Google™ Android™ OS delivers a limited-feature, smartphone-like experience with Microsoft 365 mobile apps<sup>6</sup>

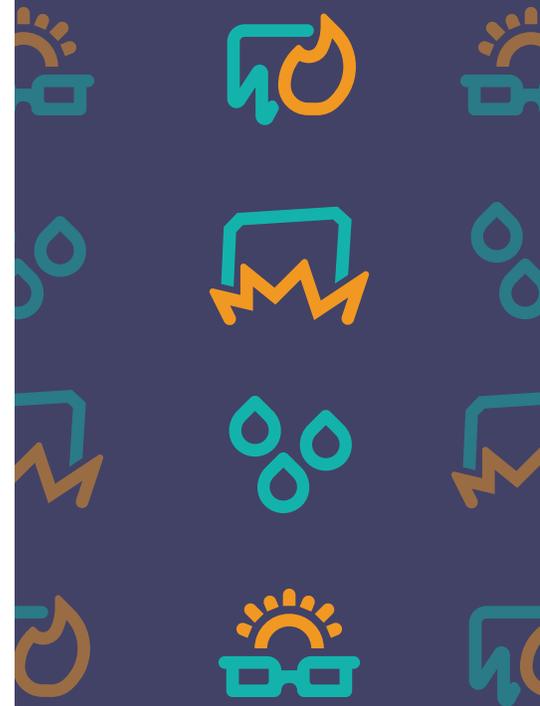
### Microsoft Surface Pro 8

- Starting price as of May 12, 2022: \$939.99<sup>7</sup>
- Our test tablet, Urban Armor Gear rugged case, and Surface Slim Pen 2 cost: \$1,128.97
- Powered by an Intel Core i5-1135G7 processor
- Windows 10 Home OS provides a full-featured, computer-like experience with Microsoft 365 desktop or online apps<sup>8</sup>

For the “resistant to weather extremes” comparison, we used Geekbench 5, a cross-platform benchmark, to compare device performance at three different temperatures: room temperature (75°F/23.9°C), extreme cold (-20°F/-28.9°C), and extreme heat (122°F/50.0°C).

For the “resistant to multiple drops” comparison, we used an in-house drop table to see how the devices fared over the course of 26 drops. To simulate rain-like conditions in the “resistant to heavy rain” comparison, we placed each tablet under a shower for 10 minutes. Finally, for the “readable in bright sunlight” comparison, we used a light meter to measure nit brightness both while the devices were unplugged and while they were plugged in.

For a deeper dive into our testing parameters and procedures, a tablet and peripherals cost breakdown, and detailed results of our hands-on testing, see the [science behind the report](#).



### Skilled labor use cases

In this report, text in the navy boxes represents fictional situations that are relevant to the results of our hands-on testing. Though the people aren't real, the examples represent a picture of the concerns users may experience in the real world.



## Stay productive on the job

One of the keys to productivity is having the right tool for the job, whether we're talking about your next car or your next business device. You're probably not going to need an all-terrain vehicle with snow tires for a bumper-to-bumper commute in Los Angeles. However, you might invest in one if you're also an avid skier or love camping in the Sierra Nevada mountains. Sure, you can throw some snow chains on your commute-rated sedan when you go skiing—but that's only going to get you so far.

Likewise, while all types of skilled laborers rely on their mobile devices to get the job done with a minimum of fuss and muss, there is no single tablet configuration that is universal to every use case. While we found after-market accessory add-ons for all the devices we tested, only the Dell Latitude 7220 Rugged Extreme Tablet contained an abundance of connections for a wide variety of skilled labor use cases.

Table 1: Feature information for the tablets we tested. Source: Principled Technologies.

	Connections	Display	Battery
Dell Latitude 7220 Rugged Extreme Tablet <sup>9</sup>	<ul style="list-style-type: none"> <li>• Mini Serial RS 232</li> <li>• 1x USB-C<sup>®</sup></li> <li>• 1x USB-A</li> <li>• Micro SD card slot</li> <li>• 2x accessory inputs</li> <li>• RF pass-through connector</li> <li>• 3x user-programmable buttons</li> <li>• Smart card reader</li> <li>• Contactless smart card reader (optional)</li> <li>• Fingerprint reader (optional)</li> </ul>	<ul style="list-style-type: none"> <li>• Outdoor-readable</li> <li>• Glove-capable</li> <li>• Gorilla<sup>®</sup> Glass touchscreen</li> </ul>	<ul style="list-style-type: none"> <li>• Dual, hot-swappable batteries</li> </ul>
Apple iPad Pro 11-inch <sup>10</sup>	<ul style="list-style-type: none"> <li>• 1x Thunderbolt™ 4 port</li> </ul>	<ul style="list-style-type: none"> <li>• Tempered glass touchscreen</li> </ul>	<ul style="list-style-type: none"> <li>• Single, non-removable battery</li> </ul>
Samsung Galaxy Tab S7+ <sup>11</sup>	<ul style="list-style-type: none"> <li>• 1x USB-C port</li> <li>• 1x Micro SD card slot</li> </ul>	<ul style="list-style-type: none"> <li>• Gorilla Glass touchscreen</li> </ul>	<ul style="list-style-type: none"> <li>• Single, non-removable battery</li> </ul>
Microsoft Surface Pro 8 <sup>12</sup>	<ul style="list-style-type: none"> <li>• 2x Thunderbolt 4 ports</li> </ul>	<ul style="list-style-type: none"> <li>• Gorilla Glass touchscreen</li> </ul>	<ul style="list-style-type: none"> <li>• Single, non-removable battery</li> </ul>

### Warehouse and logistics use case

Anthony is a senior warehouse supervisor at an energy company, where he oversees warehousing operations. His company uses Microsoft 365 apps to do everything from implementing sales and transfer orders to executing mission-critical warehousing and maintenance processes such as tracking inventory and managing rebates. Yes, his warehouses are temperature-controlled, but dock doors are open for extended hours and forklift drivers are loading/unloading trucks in the yard. Investing in a computer-like tablet means Anthony can focus on warehouse efficiency instead of worrying about Office mobile app editing limitations.

### Dell Rugged Control Center

Dell offers Dell Rugged Control Center, which is dedicated software that can help users personalize their rugged device experience and enhance productivity by making mission-critical tasks—such as camera operation, barcode scanning, and programmable button configuration—easily accessible.<sup>13</sup>

## Resistant to weather extremes

The Weather Channel reports that “All-time United States weather records were set for a wide range of extreme weather in 2021, covering everything from temperatures that parts of the country have never seen before to astonishing rainfall totals and a hurricane that gave us déjà vu.”<sup>14</sup> According to NOAA (the National Oceanic and Atmospheric Administration), a cold outbreak in February resulted in 219 locations across the central states—from North Dakota and Wisconsin to Texas, Arkansas, and Louisiana—breaking or equaling all-time cold records. A Pacific Northwest heat wave also set all-time records in dozens of locations across Washington (108°F/42.2°C in Seattle), Oregon (116°F/46.6°C in Portland), and Northern California—where air conditioning isn’t normally a necessity.<sup>15</sup>

Weather extremes can cause problems even in warehouses that are climate-controlled, where sheer size makes the buildings hard to heat and/or insulate, and HVAC units are only able to cool within a 20-degree difference between the outside and inside air.<sup>16</sup> Weather extremes are also a problem for field service technicians and shipping companies that make deliveries in temperate zones.

Cold weather (32°F/0°C and below) can cause consumer-grade tablet screens to freeze and internal components to become brittle, which shortens their lifespan. And temps above 95°F/35°C are worse than cold because “heat speeds up the chemical reactions that make [consumer-grade] batteries lose their capacity.”<sup>17</sup> It’s also important to keep in mind that storing or using any tablet outside of the recommended temperature range can nullify its warranty.

In our tests, the Dell Latitude 7220 Rugged Extreme Tablet performed well whether it was operating at room temperature or in extreme hot and cold temps. In fact, the Latitude 7220 Rugged Extreme Tablet performed slightly better in high heat than it did at room temperatures. By comparison, performance on the Apple iPad Pro 11-inch plummeted to approximately one-tenth of its room-temperature score in extreme heat while the Galaxy Tab S7+ grew sluggish. And the Surface Pro 8 shut down completely while running the Geekbench 5 workload in both extreme temperature situations. We show the multi-core extreme heat results on the next page. See the [science behind the report](#) for all “resistant to weather extremes” results.



### Construction use case

Sandra is a construction project engineer for a leading provider of environmental services to the power generation industry. She uses Bluebeam® Revu® construction management software in conjunction with Microsoft 365 apps to keep projects running smoothly. She’s often on site—checking out progress in person—and she can’t afford to stop and wait for a cold device to come to room temp every time she comes in from outside. Right now, most of her coworkers use smartphones on the job—where a lack of integration and data sharing between apps opens the door to siloing. Her pitch to upper management for new tech will outline a rugged tablet solution that is 1) powerful enough to help improve the accuracy of project progression, track workforce accountability, and provide hard metrics at each stage of the job; hardy of construction work, no matter what Mother Nature throws at the job site.

## How cold is too cold?

Most consumer-grade tablets are designed to shut off when they get too cold (32°F/0°C for the devices we tested). And users face an even bigger problem when they take that unusable brick back inside. One of the key ways to damage a consumer-grade tablet is to move it too quickly from a cold environment to a warmer one. As with laptops, the rapid temperature shift can cause condensation, which could lead to moisture within the tablet.<sup>18</sup>

## How hot is too hot?

Did you know, on a clear, sunny 70°F/21.1°C day, the temperature inside a closed vehicle can reach 104°F/40°C within half an hour and 113°F/45°C within an hour?<sup>19</sup> Sure, you can expel that heat by driving with the windows open when you leave a job site or move to the next stop on a delivery route, but this scenario is a potential problem for the three consumer-grade tablets we tested—they're only rated as operational to 95°F/35°C.<sup>20,21,22</sup>

OSHA considers outdoor heat index temps between 91°F/32.7°C to 103°F/39.4°C to be of moderate risk level to working humans and recommends implementing precautions and heightened awareness of heat-related hazards.<sup>23</sup>

That means consumer-grade tablets aren't built to handle the same rigors skilled laborers face every day.

The Dell Latitude 7220 Rugged Extreme Tablet is rated to 145°F/63°C.<sup>24</sup>



## Get consistent performance no matter where you work

Geekbench 5 CPU performance scores (multi-core)  
Normalized | Higher is better

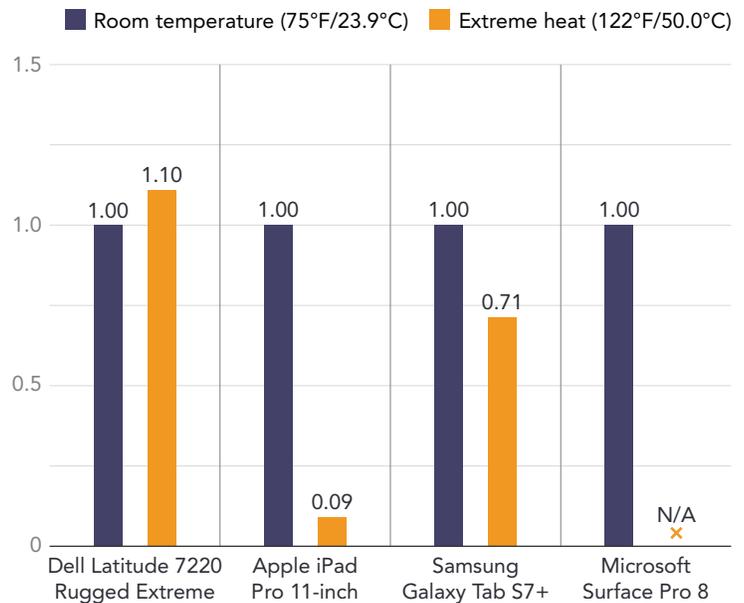


Figure 1: Geekbench 5 CPU performance scores in high heat normalized to scores at room temperature. Higher is better.  
Source: Principled Technologies.

## Published operating temps

Dell Latitude 7220 Rugged Extreme	-20°–145°F (-29°–63°C) <sup>25</sup>
Apple iPad Pro 11-inch	32°–95°F (0°–35°C) <sup>26</sup>
Samsung Galaxy Tab S7+	32°–95°F (0°–35°C) <sup>27</sup>
Microsoft Surface Pro 8	32°–95°F (0°–35°C) <sup>28</sup>



## Body shop use case

Rodrigo Garcia and his brothers own a large collision repair shop in Salt Lake City (SLC), Utah. Right now, half a dozen mechanics are using shared desktop computers. Rodrigo wants to switch to tablets, so the mechanics don't have to leave their bays to record work order changes, access vehicle specs and manuals, or order parts. By investing in tablets, he tells his brothers, the mechanics can even use the built-in camera to quickly and easily attach photos to work orders and email clients visual status updates. Their open-air shop is insulated to withstand freezing winter temps and SLC's ~56 inches of annual snowfall, so consumer-grade devices might be fine in winter.<sup>33</sup> However, consumer-grade tablet use limits of 95°F/35°C are definitely a problem during the summer—SLC is on the top 10 list of "large U.S. cities where the temperature most often climbs to 100°F (37.8°C) or higher."<sup>34</sup> The Garcia brothers need devices built to withstand overheating.

Microsoft says this about maximizing Surface battery health:

*"Avoid using or charging at extreme high temperatures: Devices that are charged or operated at high temperatures will cause accelerated deterioration of the lithium-ion battery and permanent loss of battery charging capacity. Surface devices are designed to work between 32°F and 95°F (0°C-35°C) so keep your Surface out of the sun and don't leave it in a hot car."<sup>29</sup>*

According to Samsung, if a Samsung device feels too warm:

*"Turn off Wi-Fi, GPS, and Bluetooth when you're not using them. Turn down the device's screen brightness and delete unused or unnecessary files and apps. [...] Do not use or wear the device until it cools down completely."<sup>30</sup>*

Apple says this about its devices in extreme weather:

*"Low- or high-temperature conditions might cause your device to change its behavior to regulate its temperature. Using an iOS or iPadOS device in very hot conditions can permanently shorten battery life. [...] Don't leave your device in your car, because temperatures in parked cars can exceed this range."<sup>31</sup>*

## Temperate climates

Vehicles heat up rapidly—even on fall or spring days. From a study published by the Academy of Pediatrics, where the researchers collected data on 16 clear, sunny days with ambient temperatures between 72°F/22.2°C and 96°F/35.5°C, "Regardless of the outside ambient temperature, the rate of temperature rise inside the vehicle was not significantly different. The average mean increase was 3.2°F/-16°C per 5-minute interval, with 80% of the temperature rise occurring during the first 30 minutes. The final temperature of the vehicle depended on the starting ambient temperature, but even at the coolest ambient temperature, internal temperatures reached 117°F /47.2°C. On average, there was an 40°F/4.4°C increase in internal temperature for ambient temperatures spanning 72°F/22.2°C to 96°F/35.5°C. Cracking windows open did not decrease the rate of temperature rise in the vehicle."<sup>32</sup>

## Resistant to multiple drops

Like a boxer or MMA fighter, many tablets look fine after a couple of hard hits—but their cognitive functions may start to suffer. Many people add screen protectors and tough cases in an effort to protect costly tablets. But as is true with football players, pads and helmets may protect you, but they do not toughen you up.

In our tests, the Dell Latitude 7220 Rugged Extreme Tablet fared better than all three consumer-grade tablets with their after-market rugged cases. The worst hit was the glass screen on the Microsoft Surface Pro 8, which shattered when we dropped it on its front (drop 3). It was still functional after drop 26—but the screen was cracked throughout. The Latitude 7220 Rugged Extreme Tablet was the last to sustain an injury (drop 16). To see the detailed results of our hands-on testing, please see the [science behind the report](#).

Table 2: Results of 4-foot drop testing after 26 drops from multiple angles.  
Source: Principled Technologies.

	Dell Latitude 7220 Rugged Extreme	Apple iPad Pro 11-inch	Microsoft Surface Pro 8	Samsung Galaxy Tab S7+
Appearance after 26 drops	<ul style="list-style-type: none"> <li>Slight signs of wear on edges and corners</li> </ul>	<ul style="list-style-type: none"> <li>Slight signs of wear on edges and corners</li> </ul>	<ul style="list-style-type: none"> <li>Glass screen shattered</li> <li>Additional screen damage</li> <li>Screen separated from housing</li> <li>Some touch inputs did not respond correctly</li> </ul>	<ul style="list-style-type: none"> <li>Speaker ports on case bent</li> <li>Slight signs of wear on edges and corners</li> </ul>
Usability after 26 drops	<ul style="list-style-type: none"> <li>Fully functional</li> </ul>	<ul style="list-style-type: none"> <li>Fully functional</li> </ul>	<ul style="list-style-type: none"> <li>Compromised</li> </ul>	<ul style="list-style-type: none"> <li>Fully functional</li> </ul>

### Potential cracked tablet screen problems

- Touchscreen malfunctions
- External debris can damage internal parts
- Generation and loss of heat can drain the battery
- Potential finger damage



### Healthcare use case

Gabby, recently hired as Director of Nursing at a regional hospital, has convinced the hospital board to invest in mobile technology to streamline patient processing and care. Right now, hospital staff access clinical and non-clinical data through nursing station desktops and medical laptop carts. But, with beds running short and days running long, they need a more portable option that is also easy to disinfect between patients. Gabby needs tablets for hospital staff wearing personal protective equipment (PPE) that includes exam gloves—so glove-capable touchscreens and devices that bounce back from accidental drops on hard floors are important features. Gabby's future at this hospital may very well depend on whether this initiative meets patient safety goals, improves operational efficiency, reduces the cost of quality care, and delivers a good ROI.



### Marine industry use case

Charles is a marine technician for a boat service business that on the eastern seaboard. He needs access to OEM software, tools, and technologies to diagnose problems on all types of commercial and pleasure vessels. While everything onboard is exposed to wet and/or humid conditions—including the industrial computers these vessels and their crews use in navigation—Charles is tempted to just buy a consumer-grade tablet with a rugged case. However, the threat from an accidental drenching and corrosive salt fog is greater around water than it is on dry land.

## Resistant to heavy rain

Beverage spills and accidental dunkings can do more than zap internal circuitry—the loss of a usable work device can tank productivity and jeopardize the data stored inside. There are water removal services out there. For example, Staples offers in-store TekDry® services to pull the water out of a wet tablet, but they admit they can't save all devices. TekDry services for a tablet, at the time of this report, cost \$69.99.<sup>35</sup>

To simulate very heavy rain-like conditions, we placed each tablet under a shower for 10 minutes. First, we positioned each system in portrait orientation, and after 5 minutes, we adjusted the systems to be positioned in a landscape orientation. In our tests, the Dell Latitude 7220 Rugged Extreme Tablet stayed powered on the whole time, had no visible damage, and was totally functional after we removed it from the shower—so you don't have to worry if it gets wet or you accidentally leave it in the rain. The consumer-grade tablets we tested did not fare as well. None of the consumer-grade tablets stayed on for the entirety of this test and neither the iPad Pro 11-inch or the Surface Pro 8 were functional after 20 minutes in dry conditions.

Table 3: Results of rain testing after 10 minutes under a heavy spray of water.  
Source: Principled Technologies.

	Dell Latitude 7220 Rugged Extreme	Apple iPad Pro 11-inch	Microsoft Surface Pro 8	Samsung Galaxy Tab S7+
Remained powered on	Yes	No <i>Shut down after 1 minute</i>	No <i>Shut down after 5 minutes and 30 seconds</i>	Yes <i>Shut down after removal from wet conditions</i>
Functional after 20 minutes in dry conditions	Yes	No <i>Touchscreen unusable</i>	No <i>Would not power on</i>	Yes
Free from visible signs of water damage	Yes	No <i>Screen appeared damaged</i>	No <i>Water seeped into the screen</i>	Yes

## Readable in bright sunlight

Anyone who's ever tried to use a phone or tablet outdoors knows how hard it can be to see anything on the glass screen. Sure, you can shift your position, install a screen protector, or fiddle with display contrast, but wouldn't it be nice if you just didn't have to worry about it? The Dell Latitude 7220 Rugged Extreme Tablet has an outdoor-readable, anti-glare, and anti-smudge polarized display, which makes it easier to read maps, check job orders, and pull up pertinent product or service delivery information.<sup>36</sup>

For this comparison, we used a light meter to measure nit brightness both while the devices were unplugged and while they were plugged in. We found that the Dell Latitude 7220 Rugged Extreme Tablet provided up to 2.9 times more nits while unplugged and 2.4 times more when plugged in.



### Up to 2.9x brighter screen

Screen brightness (nits) | Higher is better

Dell Latitude 7220 Rugged Extreme	Apple iPad Pro 11-inch	Samsung Galaxy Tab S7+	Microsoft Surface Pro 8
Plugged in			
960	417	329	390
Unplugged			
820	417	329	340

Figure 2: Screen brightness measured in nits. Higher is better. Source: Principled Technologies.

### What is a nit?

The more nits your tablet has, the brighter the display is. A nit measures the luminous intensity spread over the tablet screen. "A screen with a lot of nits will look bright and clear even on the sunniest of days."<sup>37</sup>



### Survey use case

Andrea is a land surveyor for an energy company in the Pacific Northwest. In addition to a total station theodolite, Andrea uses Trimble Geospatial software, AutoCAD® Civil 3D, and Microsoft 365 applications to get her job done. She wants a user-friendly device with a high-visibility screen to facilitate accurate data collection and analysis. Even better would be a versatile tablet that does everything her Windows-based office computer does.



## Conclusion

In our hands-on testing, the Dell Latitude 7220 Rugged Extreme Tablet brought with it more skilled labor use case-specific capabilities and features than the consumer-grade tablets we tested. Plus, its moderately higher price included a built-in protective design (no need to buy a protective cover!) as well as a Dell Rugged Active Pen—we had to purchase protective covers and styluses for all of the consumer-grade competitors.

In addition to superior capabilities and features, we found that the Dell Latitude 7220 Rugged Extreme Tablet performed comparably whether it was operating at room temperature or in the extreme heat and cold that skilled laborers face every day. The consumer-grade tablets we tested didn't fare as well. The Surface Pro 8 shut down completely while running the workload in both extreme heat and extreme cold. And, in extreme heat, the Galaxy Tab S7+ grew sluggish while performance on the Apple iPad Pro 11-inch dropped to one-tenth of its room-temperature score.

As for durability, we found that the Latitude 7220 Rugged Extreme Tablet remained powered on in heavy rain, was fully functional after 26 drops, and had a brighter screen than the competitors.

Key to productivity is having the right tool for the job—so if you don't sit behind a desk in an air-conditioned office, it might be time to consider investing in the Dell Latitude 7220 Rugged Extreme Tablet.

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This project was commissioned by Dell.