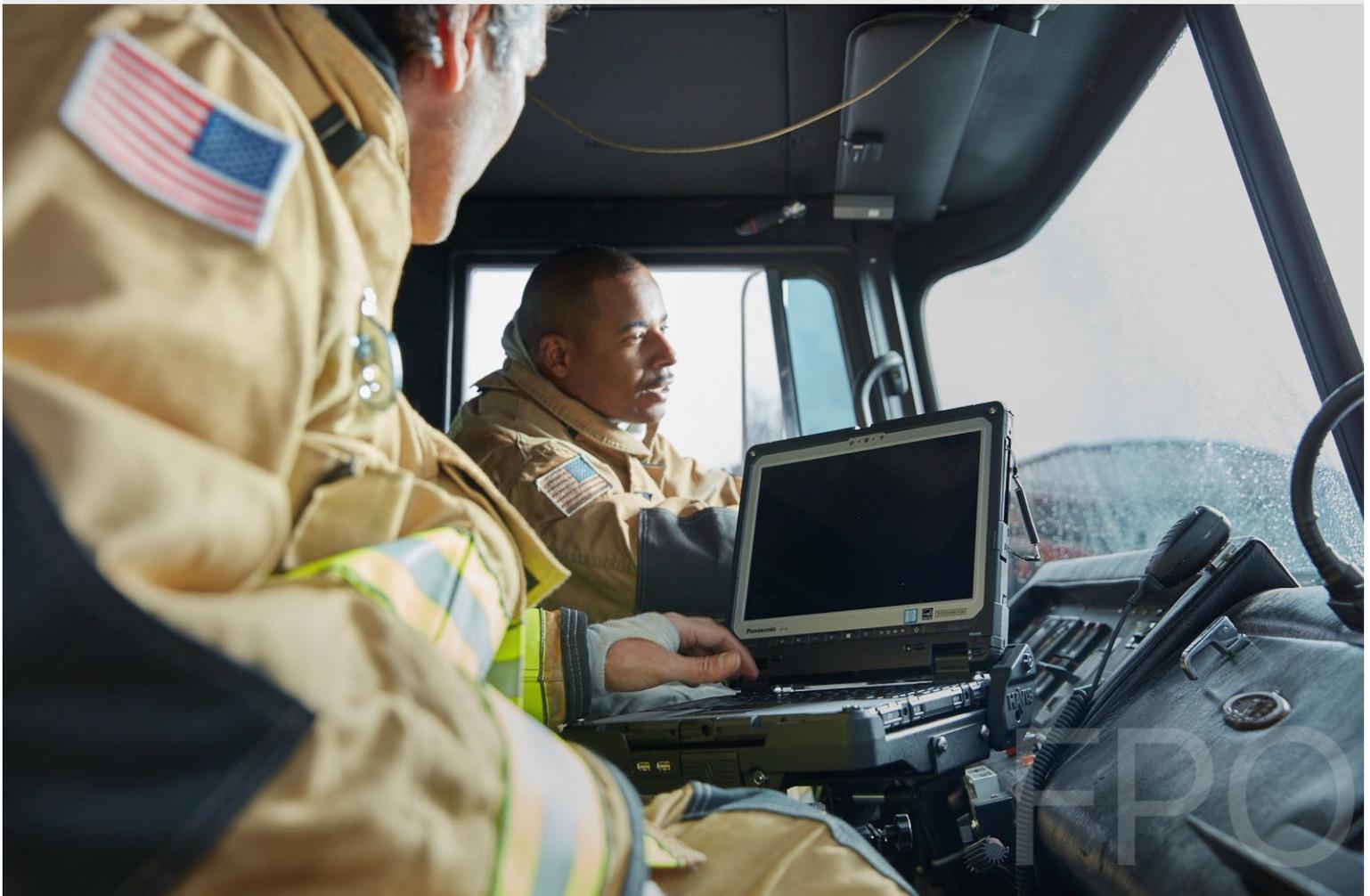


CRITICAL WIRELESS CONNECTIVITY



**A PRACTICAL GUIDE FOR SELECTING MOBILE DEVICES
THAT KEEP YOUR WORKERS CONNECTED**



HIGH STANDARDS FOR WIRELESS CONNECTIVITY

Reliable wireless connectivity and uninterrupted service from cellular and Wi-Fi networks is not just nice to have—these days it's mandatory. Unreliable connectivity can hurt your business and frustrate your mobile workers and customers. Whether your employees operate in harsh indoor conditions at manufacturing plants or in unpredictable weather atop utility poles, they can't get work done without consistent wireless connectivity they can count on.

It may seem obvious that a dependable wireless network is essential to connectivity, but that's only half the story. Reliable wireless connections are also dependent on the quality of your mobile device. Ubiquitous network coverage does you and your field workers little good if the mobile computers you use drop connections.

Always-on wireless connectivity

Businesses with mobile workforces rely on constant connectivity to communicate with headquarters, colleagues, customers, sensors and other data processing devices. Where many mobile devices fail is in reliably maintaining these connections, especially for those employees who work in extreme environments. These workers may encounter dead spots or signal interference in warehouses or experience spotty coverage while transporting goods through remote areas or racing to an emergency that crosses networks.

This guide is designed to help you evaluate and select mobile devices that can stand up to rugged workplace conditions and keep you connected.



CONNECTIVITY IS A BIG DEAL

59%

of all surveyed executives said that the biggest threat to their organization would be failure to adapt to hyperconnectivity—connecting people, organizations and objects via the Internet, mobile technology and the Internet of Things (IoT).¹

94%

reported that constant connectivity and 24/7 data access is important for their employees, with 43 percent saying it's critical.²

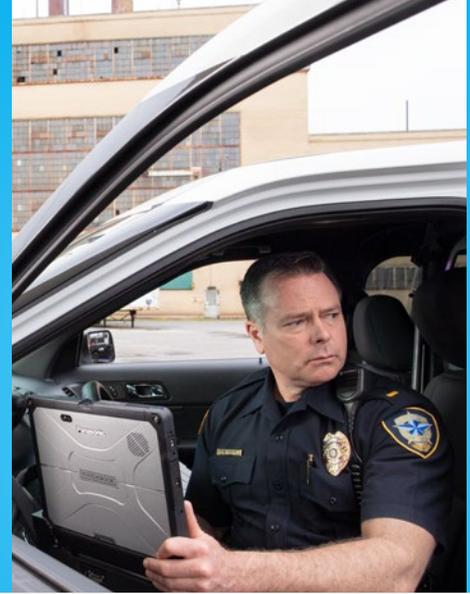
69%

of that group said their organization only relies on basic device connectivity capabilities.²

1. "Hyperconnected Organisations," The Economist Intelligence Unit Ltd. (2015).

2. *Getting Mobility Right*, Panasonic (2016).

EIGHT WIRELESS CONNECTIVITY CONSIDERATIONS



Your connectivity needs are most likely complex and varied, but success comes down to two things: device reliability and connectivity reach. Panasonic TOUGHBOOK® mobile devices deliver this one-two punch for businesses in nearly every type of rugged environment. Consider the following when you evaluate connectivity performance for mobile devices that will be used in harsh environments.

1. A layered approach to connectivity

Given the critical nature of the work, many organizations using ruggedized mobile devices depend on several layers of connectivity enhancements to keep teams linked to applications and headquarters. Panasonic TOUGHBOOK devices support this multilayered approach, and are designed and manufactured to:

- Deliver on high-speed connectivity needs by using select high-performing antenna modules and components.
- Make network handoffs smooth and secure by enabling seamless connections between cell sites and Wi-Fi access points.

2. Connectivity components with interference protection

A dedicated team of wireless engineers at Panasonic custom selects and tests the antenna modules, and then tests the placement of the antenna module in the device to make sure the connectivity performance meets or exceeds the

leading carriers' wireless network requirements. Our experience in antenna module design has led to innovative module placement and wiring path design, enabling us to optimize performance and protect against internal and external interference.

Radio frequency interference (RFI) and electromagnetic interference (EMI), both caused by the noise and heat coming from a device's CPU or other internal components, are common culprits that can negatively impact performance and slow transmission speeds. Heat can also create frequency shifts, causing communication drops and poor connectivity, as well as internal device degradation over time.

The design of the device and the quality of its wireless components affect the amount of interference experienced. Many mobile computing device manufacturers use USB modems, making them vulnerable to bumps, disconnects and other damage. Additionally, USB modems are more susceptible to environmental interference in a transmission area, resulting in poor reception.

Instead, Panasonic uses advanced integrated wireless technology and embedded antennas to minimize, if not eliminate, interference problems in TOUGHBOOK devices. Panasonic-embedded antennas are located next to the LCD screen and away from internal components to shield against internal interference caused by noise and heat and to help ensure unblocked wireless transmissions. In addition, the antenna does not rely on an external PC Card—which is susceptible to damage and interference and can result in poor connection performance.

EIGHT WIRELESS CONNECTIVITY CONSIDERATIONS



3. Proven wireless performance testing

Panasonic performs rigorous testing of its embedded wireless antennae modules, operating one of the industry's largest anechoic chambers for testing. This yields a number of benefits:

- The state-of-the-art chamber blocks unwanted radio signals and interference, producing a controlled environment for testing RFI signals on TOUGHBOOK® wireless products.
- By precisely measuring the amount of electromagnetic radiation produced by TOUGHBOOK mobile computers, anechoic chamber testing enables engineers to maximize wireless performance.
- Over-the-air (OTA) tests are also performed in the chamber, including tests for total isotropic sensitivity (TIS) and total radiated power (TRP), which help continuously improve upon customized antennas and modules.
- Testing is performed in heat, cold, rain and other real-world conditions, helping testers to evaluate wireless driver performance, connection manager software performance, and variable environmental and network conditions that users commonly encounter while traveling.

The results of these tests help Panasonic engineers isolate and address problem areas before the final design is approved for manufacturing. These tests also help ensure that

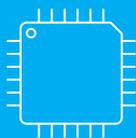
customers have access to robust, consistent connections across a wide range of industries and environmental settings.

4. Rugged reliability

Panasonic TOUGHBOOK laptops have an average failure rate of 2.5 percent, far outpacing the 11 percent industry-average failure rate of consumer devices, and twice as dependable as the 4 to 6 percent failure rate of other rugged devices.³ But Panasonic reliability goes beyond the device, providing peace of mind through comprehensive warranty plans and technical support.

Panasonic's standard warranty protects your TOUGHBOOK rugged laptops, tablets and handhelds from manufacturing defects for three years and includes a priority parts exchange program and repair service at no cost. This service plan also provides:

- Lifetime access to U.S.-based technical support
- Online access to drivers, first-aid disks, BIOS updates, tools, utilities and manuals
- Free overnight delivery of customer-replaceable parts and repaired units
- Access to Panasonic field service personnel
- Optional extended warranty coverage and protection services³



QUALITY COMPONENTS

Unlike most device manufacturers, Panasonic controls virtually the entire manufacturing process, from product design through product delivery, for TOUGHBOOK mobile computers and tablets.

By retaining control of design, sourcing, manufacturing and fabrication, Panasonic obtains the highest level of quality, reliability and performance for its customers—which translates into lower total cost of ownership and greater return on investment.

EIGHT WIRELESS CONNECTIVITY CONSIDERATIONS



5. Secure wireless connections

Panasonic supplies rugged industries with highly reliable wireless devices that also enable safe access to data through secure connections on Wi-Fi, Bluetooth® and mobile broadband.

We can also provide data and device protection through our partner Absolute Software. Absolute Persistence software is embedded in device firmware and provides self-healing, two-way connections for endpoint visibility and control, defense against threats, guaranteed connections on or off network, and remediation of events. Easy-to-deploy Absolute for Android® software is available for all Android devices and offers similar protections, assessing vulnerabilities and providing proof of compliance.

6. Seamless global connectivity

For organizations that want to connect their mobile workforce around the world, Panasonic offers P.180, a global connectivity service and management platform that offers mobile workers network connectivity across geographies for TOUGHBOOK® mobile devices. The P.180 platform uses eSIM technology to deliver global scalability via local connectivity with Tier 1 connectivity in 180 countries, including 60 full LTE networks. Together, P.180 and TOUGHBOOK mobile computers offer a complete hardware and connectivity solution under a single service umbrella, with pricing predictability and no roaming fees.

7. Presales support and field testing services

The industry-leading Panasonic ProServices team is a U.S.-based network of knowledgeable experts with deep industry experience. We can work with you to help design your solution and choose a device, software and services fine-tuned to your business applications. Our field engineers can help test and streamline your deployment to make sure you have the right mobile solution to keep workers connected and productive.

8. Future outlook

Next-generation wireless technologies are constantly evolving, so it's critical that your mobility partner is ahead of the connectivity curve. Panasonic can help you transition to new capabilities as they come onto the market. To keep ahead of new demands for connectivity and communication, we're always closely watching and testing new technologies:

• 5G technology

5G networks are being rolled out in many markets, bringing faster speeds and new capabilities to mobile devices.

• FirstNet® and first responder solutions

Devices used by first responder and other emergency services must be able to use FirstNet, the high-speed, nationwide broadband network dedicated to emergency and public safety personnel. As new network capabilities continue to roll out, Panasonic, an authorized FirstNet Dealer, can help public safety organizations future-proof their technology investment while helping them connect to the network today.

• IoT, augmented reality and streaming video

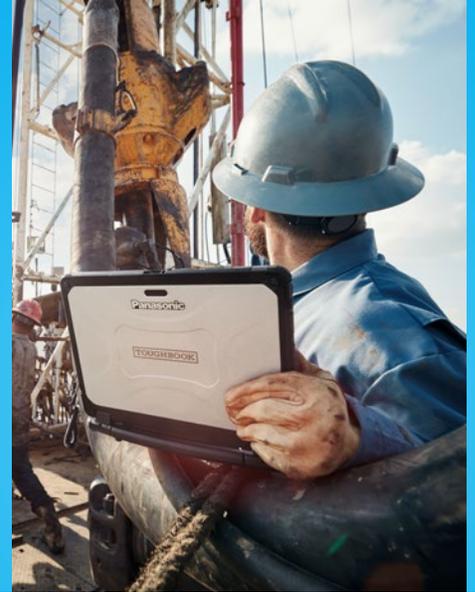
These capabilities are becoming more important in some industries and require high-performance computing power and reliable, high-quality connectivity.

EVALUATION CHECKLIST

Use this checklist to help you evaluate connectivity capabilities for mobile workers in rugged environments.

- Look for mobile laptops, tablets and handhelds that are tested and have third-party validations of meeting the MIL-STD-810G claims and come equipped with current eSIM technology.
- Make sure the device supports reliable connections in all types of environments and gives users the ability to easily switch communication modes.
- Devices should come with vendor-neutral data service and/or multicarrier modems.
- Look for security that protects connectivity as well as device access and the data stored on the device.
- Check with the manufacturer to review their failure rates and wireless testing results. The dependability of wireless and GPS capabilities is perhaps the most important criterion for judging a rugged mobile device.
- Look closely at the manufacturer's warranty plan. What are the service levels and guidelines for repairs and replacement parts, availability of a technical support hotline and next-level field service personnel?
- Opt for one-stop shopping with device manufacturers that also offer seamless global connectivity with pricing predictability.
- Keep an eye on the future. Can the device support new technologies that you may adopt in your organization in the near future? Does the device manufacturer have plans for integrating network services like 5G and other new technologies into their product roadmap?
- Look for a manufacturer that offers both technical and industry expertise and can provide services to help you select, test and

INVEST IN TOUGHNESS AND ALWAYS-ON CONNECTIVITY



Panasonic devices deliver on state-of-the-art connectivity needs, helping to ensure that business and government mobile workers are prepared to adopt future technologies, no matter where their work takes them. Depending on your mobile worker needs, we can help you customize a TOUGHBOOK® solution with a range of wireless connectivity options, including:

- Optional 4G LTE Advanced multicarrier mobile broadband with GPS
- Optional dedicated GPS (u-blox NEO-M8N)
- Dual high-gain antenna pass-through
- Intel® Dual Band Wireless-AC 8260 Wi-Fi 802.11a/b/g/n/ac
- Bluetooth® v4.1 (Class 1) + EDR13
- Optional contactless smart card/Near Field Communication (NFC) reader and other integrated options
- P.180 global wireless data connectivity service offered by Panasonic
- FirstNet Ready™ devices with Band 14 capabilities
- FirstNet® SIM card activations

WHATEVER YOUR INDUSTRY—FROM TRANSPORTATION AND MANUFACTURING TO PUBLIC SAFETY, UTILITIES AND DEFENSE—PANASONIC DEVICES ARE ON THE FRONTLINES WITH BREAKTHROUGH CONNECTIVITY THAT MAKES SURE YOUR WORKERS CAN ACCESS THE DATA THEY NEED AND WORK EFFECTIVELY.



**FOR TODAY'S MOBILE WORKER,
RELIABLE CONNECTIVITY ISN'T
A LUXURY, IT'S MANDATORY.**

For more information on Panasonic mobility:

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