TECHNOLOGY FOR COMPLEX WAREHOUSE ENVIRONMENTS

Why Ultra-Long-Range Scanning Is Becoming Essential
for Mobile Computers in Modern Warehouses and Distribution Centers

Honeywell

EXECUTIVE SUMMARY

The landscape of modern warehouses and distribution centers has undergone a remarkable transformation over the past decade. Once viewed as straightforward operational spaces, these facilities have evolved into complex systems characterized by expansive layouts, rapid logistics, and stringent operational demands. Today's facilities not only require more advanced technology; they also need tools that meet the challenges of their increasingly intricate environments.

Traditional scanning devices, which were designed for lesser and more forgiving conditions, are no longer adequate. In this white paper, we will analyze why ultra-long-range scanning is not merely a premium enhancement or niche feature, but a necessity in modern logistics. This technology, particularly when integrated into multifunctional mobile computers, serves as a practical response to the harsh realities of contemporary warehouses, where distance, dust, moisture, safety constraints, and time pressures threaten operational efficiency and human performance.

By leveraging ultra-long-range scanning within mobile computing, organizations can mitigate these challenges, bolstering throughput, accuracy, safety, and worker confidence significantly.



INTEGRATING ADVANCED MOBILE TECHNOLOGY IN COMPLEX WAREHOUSE SYSTEMS

Historically, distribution centers were often viewed as controlled environments; however, this perception increasingly clashes with reality. Today, expansive physical layouts with lengthy aisles and towering high-bay racking create unique challenges for workers. To enhance space optimization and efficiency, many centers have adopted multilevel pick faces, complicating operations through greater distance in scanning requirements.

Alongside their expansive and vertically complex structures, today's distribution centers include temperature-variable zones, such as cold storage areas, that impose additional demands on worker efficiency and equipment performance. The operational environment is dynamic and bustling, populated by human workers, forklifts, and automated systems. Amidst this complexity, the expectation for precision remains unwavering, especially as workers frequently need to scan labels from a distance while navigating additional challenges like poor lighting, obstructions, or worn labels.

While emerging technologies like ultra-long-range scanning are vital, true intelligence in warehousing extends beyond automation. Forbes reports it requires a comprehensive approach that combines cutting-edge technology with high-quality processes and a deep understanding of supply chain dynamics. Modern warehouses must be resilient systems that align with the specific needs of their products and customers, ensuring adaptability amidst changing market dynamics.[1]

According to the 2025 Warehouse/DC Operations Survey, warehouse operators are increasing their capital spending, with average project budgets rising from $1.8 million last year to over $2.1 million this year.[2] This reflects a strong commitment to enhancing operational efficiency through technology adoption, including advanced warehouse management systems and automation. Additionally, the long-range barcode scanner market is poised for significant growth, projected to increase from approximately $2.37 billion in 2024 to about $5.51 billion by 2033, representing a compound annual growth rate (CAGR) of 9.8%.[3] This expansion is largely driven by the rising need for efficient inventory management and the rapid growth of e-commerce activities worldwide.

The integration of multifunctional mobile computers, equipped with ultra-long-range scanning capabilities is necessary to keep pace with such demands, enhancing worker performance and satisfaction.

$2.1M

INCREASE OF CAPITAL SPENDING IN 2026
for warehouse operators[2]

$5.51B

ESTIMATED GROWTH BY 2033
for the long-range barcode scanner market[3]

"As warehouses evolve into more dynamic ecosystems, the challenges they face demand not just advanced technologies, but a profound shift in how we approach these environments. Ultra-long-range scanning is not merely an enhancement; it is an essential tool that transforms how we navigate the challenges of modern distribution centers. By embracing this technology, we empower the workforce to maintain accuracy, safety, and efficiency, even in the most demanding conditions. "

TAYLOR SMITH,
CHIEF MARKETING OFFICER, HONEYWELL PRODUCTIVITY SOLUTIONS AND SERVICES

1. Smart Warehousing Doesn't Mean Automated, It Means Smart, Forbes
2. 2025 Warehouse/DC Operations Survey: Tech investment marches on, Modern Materials Handling
3. Long-Range Barcode Scanners for Warehouses Market Research Report 2033, Growth Market Reports

FACING THE CHALLENGES OF HARSH ENVIRONMENTS

In practice, the operational challenges within modern warehouses are persistent hurdles, not merely exceptional occurrences. Moisture infiltrates from refrigeration units and washdowns, while dust and debris accumulate from corrugated materials and packaging supplies. Labels, critical for inventory management, often become scuffed, warped, or obscured, reducing operational efficiency.

Today's mobile computers are engineered to withstand these demanding environmental factors. With rugged designs that resist moisture, dust, and impact, they help ensure reliable performance even where traditional scanning systems fall short. This durability is essential, as it creates a safer and more efficient working atmosphere.

THE COMPOUNDING EFFECT OF DISTANCE

As warehouses expand to accommodate greater volumes of inventory and enhance operational efficiency, the necessity for workers to scan merchandise from farther away increases. Distance brings unique complications, environmental conditions may haze visibility or diminish contrast, while protective gear limits dexterity. The cumulative effect of these factors slows operations and heightens uncertainty among workers. Furthermore, in operations involving forklift trucks and moving pallets, long-range scanning significantly enhances efficiency. Drivers can seamlessly reach and scan shelf and pallet labels from their seats, eliminating the need to dismount repeatedly to scan codes. This capability drastically reduces the time wasted during these repetitive tasks, allowing operators to maintain focus and continuity in their workflow while ensuring operational precision.

Ultra-long-range scanning embedded in mobile computing provides versatility and allows workers to confirm identifications from a safe distance, drastically reducing the need for time-consuming close-range adjustments. This innovative capability not only streamlines operations but also enhances compliance with safety regulations by minimizing unsafe movements.

COLD STORAGE AS THE ULTIMATE STRESS TEST

Cold storage environments present a pronounced challenge for conventional scanning methodologies. Employees must maintain productivity in frigid conditions while managing cumbersome protective clothing, all of which restrict fine motor skills. If a scanning system cannot operate effectively in these extreme conditions, it is unlikely to meet broader operational demands.

However, mobile computers with ultra-long-range scanning capabilities serve as a critical solution in these austere settings, ensuring reliable performance where it is needed most. They undergo rigorous testing in challenging environments, providing reassurance that they can handle the complexities of warehouse operations.

DESIGNING WITH THE WORKER IN MIND

The most compelling value proposition behind ultra-long-range scanning within mobile computing is its focus on human-centered design. This technology empowers workers rather than overburdening them, optimizing performance while allowing for greater flexibility in their tasks.

While integrating advanced technologies such as ultra-long-range scanning is essential for enhancing operational efficiency, it's equally crucial to consider how these solutions affect the workforce. Gartner report Chief Supply Chain Officers (CSCOs) face challenges such as labor shortages and the pressing need for strategic investments in technology to keep pace with evolving market demands.[4] Addressing worker concerns about automation's impact on job security is vital for fostering a successful environment. Organizations must implement comprehensive training programs and maintain continuous engagement to equip employees with the skills they need to leverage new technology effectively.



A CLEARER LENS: ULTRA-LONG-RANGE SCANNING AND MULTIFUNCTIONAL MOBILE DEVICES

Unlike traditional scanning technologies that struggle to decode quickly and accurately, ultra-long-range scanning technologies focus on establishing certainty. The adoption of such systems enables workers to confirm label identifications efficiently while maintaining safe working positions. This technology also extends human perceptual capabilities, allowing workers to accomplish tasks with higher efficiency and reduced cognitive load.

By emphasizing first-pass accuracy and minimizing dependence on ideal conditions, ultra-long-range scanning increases operational reliability. Organizations can ensure that their workforce operates effectively, fostering confidence and reducing interruptions due to uncertainty.

"Our commitment to human-centered design ensures that technology serves as an enabler, allowing businesses to thrive amid disruption and uncertainty. The future of logistics belongs to those who adapt, innovate, and prioritize the needs of their teams."

TAYLOR SMITH,
CHIEF MARKETING OFFICER, HONEYWELL PRODUCTIVITY SOLUTIONS AND SERVICES

4. Future of Supply Chains 2025: 4 Proven Paths, Gartner

Creating stability and increasing productivity in demanding warehouse environments requires technological designs that prioritize accuracy and user-friendliness. By emphasizing intuitive interfaces and minimizing cognitive and physical friction during scanning tasks, the systems can enhance overall operational reliability. Additionally, understanding real-world factors, such as moisture, dust, and wear, will further ensure that the technology is practical and accessible for its users.

Ultimately, designing with the worker in mind involves not only the implementation of advanced technologies but also fostering a culture of support and empowerment. By investing in employees and valuing their expertise, organizations can maximize the benefits of ultra long- range scanning systems, leading to improved productivity and job satisfaction among the workforce.

ENHANCING PRODUCTIVITY THROUGH TIME EFFICIENCY

In the high-stakes environment of modern warehouses and distribution centers, time savings are a crucial factor in enhancing operational productivity. In fast-paced settings where every second counts, even incremental efficiencies can lead to significant gains. For instance, over the next two years, over half of companies aim to improve picking efficiency[5], indicating a strong drive to streamline operations. Technologies that streamline processes directly translate into more efficient workflows, enabling organizations to swiftly respond to evolving demands. For forklift operators in particular, long-range scanning technology becomes a game-changer. By enabling drivers to scan shelf and pallet labels from their seated positions, the technology minimizes interruptions, improves workflow continuity, and reduces physical strain. Eliminating the need to step on and off forklifts not only saves time but also enhances worker satisfaction, translating to a more efficient and streamlined operation overall.

With ultra-long-range scanning, workplace efficiency can significantly improve as workers spend less time repositioning to align with scanners. By reducing these repetitive tasks, teams can dedicate more time to high-value responsibilities, improving productivity and morale while minimizing physical strain on workers.

The implications of these time savings extend beyond individual performance metrics. Improved efficiency leads to reduced labor costs, as organizations optimize their workforce allocation and minimize overhead expenses. As indicated in the 2024 Automation Study, a significant 66% of companies seek to enhance warehouse capacity utilization[5], highlighting the necessity to maximize resources in a competitive environment. The enhanced ability to meet the growing demands of e-commerce is essential for maintaining a competitive edge; faster response times and increased accuracy result in greater customer satisfaction.

Additionally, adopting advanced technology like ultra-long-range scanning contributes to a more motivated workforce. Employees who feel empowered by efficient tools experience lower turnover rates, as they encounter less fatigue and greater proficiency in their roles. This sentiment is supported by the observation that 42% of warehouses currently operate with a blend of manual and automated processes[5], indicating a substantial opportunity for innovation to drive productivity. This not only enhances the work environment but also fosters a culture of productivity and adaptability in a rapidly changing market.

5. 2024 Automation Study: How automation is transforming the warehousing landscape - Modern Materials Handling

CLOSING THOUGHTS: CERTAINTY IN COMPLEXITY

As modern warehouses embody complex, evolving environments, traditional scanning methods increasingly fall short of meeting their demands. The interplay of factors such as distance, temperature fluctuations, debris and other interferences, and safety challenges creates complexities that can hamper operational fluidity.

Long-range scanning emerges as a vital solution, perfectly aligning with the realities of contemporary logistics operations. By providing certainty amid these challenges, organizations can maximize throughput, precision, and safety, while also boosting worker confidence.

The evolution of scanning technology should be viewed not merely as an upgrade but as a strategic imperative in navigating the complexities of today's logistical landscape.

REAL SOLUTIONS FOR COMPLEX CHALLENGES

As the logistics industry continues to evolve, the necessity for adaptable and resilient technology becomes paramount. At Honeywell, we understand that thriving in dynamic warehouse environments requires solutions that are not only advanced but also ruggedly reliable. The challenges of today's warehouses demand equipment that can endure the test of time and adversity.

Our commitment to first-pass accuracy and operational reliability is reflected in the rugged design of our ultra-long-range scanning solutions. These solutions enhance worker confidence and throughput by combining cutting-edge technology with the durability needed to withstand demanding conditions, much like our reputation in rugged mobile solutions. With Honeywell's heritage in engineering excellence, our mobile computing systems are built to meet and exceed the rigorous demands of real-world environments.

Trust in Honeywell means investing in a partner dedicated to pioneering advancements and empowering your workforce, propelling your business forward in today's competitive landscape.

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