



ZEBRA AUTOMOTIVE SOLUTIONS

# New Engineering Approaches Drive the Next Generation of Auto Manufacturing

Market-leading enterprise technology for achieving  
“right first-time performance” and streamlined operations  
across the automotive value chain



## Keeping Up With the Pace of Progress

The automotive industry faces many of the same challenges as all manufacturers across industries: finding and retaining a qualified workforce, navigating supply chain disruptions, and delivering on heightened expectations around speed and accuracy.

However, automotive manufacturers face some unique, market-specific challenges as a confluence of trends combines to reshape the industry's future. As the technology develops and becomes more accessible, the industry is transitioning from a hardware business to a service-driven and software-based one. These shifts change the design and production of vehicles as well as how they are marketed and sold to consumers. Automakers must now consider the customer experience end-to-end, reinventing product lines and rethinking their business models.

Automakers must strike a tricky balance. Most must still operate a traditional model, maintaining development and production lines for conventional internal combustion engine (ICE) vehicles into the near future. At the same time, they must plan for a smooth transition phase between ICE vehicles and electric vehicles (EVs), which have different requirements from raw materials to final assembly and delivery to consumers.

Further, automakers and OEMs must keep an eye on the future and prepare for even longer-term realities. As business models continue to evolve, all automotive manufacturing and distribution entities must embrace digitalization to differentiate their offerings and gain a competitive edge. During this time of dramatic transformation, manufacturers who do not keep pace with progress are at significant risk of being left behind.

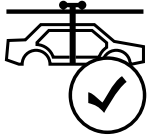


**Automakers may be hesitant to invest in new technology at a moment when the future feels uncertain.**

In Zebra, however, manufacturers have a trusted partner for future-proofing operations. Serving more than just point solutions, Zebra's full suite of devices and intelligent-edge applications can work together to create a more efficient manufacturing ecosystem.

# Overcoming Operations Challenges

The auto industry transformation will have massive implications for everyone along the value chain, from OEMs to consumers. Forward-thinking leaders are turning to technology to streamline global operations, increase efficiency on factory floors, and keep up with changes in consumer demand. Here's why.



## Revolutionizing the Manufacturing Process

Manufacturers are facing pressure to do more in less time. Production demands efficient sequencing, ensuring that all parts arrive in the correct build sequence just-in-time. Intelligent-edge solutions infuse workflows with automated optimization and valuable insights, helping to maximize floor space for the manufacturer and minimize wait times for consumers.



## Supply Chain Issues Exasperate Production

Shortages or delays throughout the supply chain often leave manufacturers waiting for components and, as a result, unable to meet consumer demand or accurately forecast future delivery schedules. Global events like the war in Ukraine add further uncertainty via international travel disruptions and dramatically fluctuating commodity prices.



## Consumer Demand is Shifting

The negative environmental impact of fossil fuels and skyrocketing fuel costs combine to create massive disruption in the automotive industry, driving billions of dollars of investment into the increased demand for EVs or hybrid vehicles and increased demand for more safety and personalization options. Other mobility solutions, such as autonomous vehicles or rideshares, proliferate, driven by consumer cost savings and the increased availability of improved internet activity.



## Not Achieving "First Time Right" Will Cost You

Internal and external production failures can cost a manufacturer up to 12% in annual sales.<sup>1</sup> A manufacturing environment designed with failure prevention in mind will be less costly than reactive solutions added to an already built production line. Investments in preventive costs are the right approach to long time product quality.



83%

89%

**83% of decision-makers and 89% of associates agree augmenting labor with technology and devices first is the best way to introduce automation into warehouse operations.<sup>2</sup>**

<sup>2</sup> Zebra Technologies, Warehousing Vision Study, "Dynamic Markets Demand Warehouse Agility," 2022.

<sup>1</sup> SAI Global, "True Cost Of Quality In The Automotive Industry," February 4, 2020.

# The Relentless Pursuit of Quality and Efficiency

Vehicle defects and recalls are expensive, and quality issues impact customers' perception of an automaker, creating potential knock-on effects in the long term. In 2021, an estimated 21.3 million vehicles were accounted for in recalls by the National Highway Traffic Safety Administration (NHTSA). Automakers face even more previously unknown issues as the industry embraces new technologies and shifts to producing more EVs.<sup>3</sup>

The key to error-proof assembly is digitizing critical information, making it instantly accessible on mobile computers for inspection teams. Using technology to identify potentially defective components and incorrect installations saves millions and better protects consumer safety. With Zebra, manufacturers can build seamless workflows that ensure the simple, accurate, and automated capture of quality data with bulletproof audit trails.



## Matrox Imaging Frame Grabbers

Matrox's industry-leading frame grabber lineup pairs machine vision and deep learning to automatically detect anomalies with increasing fidelity. Ideal for the demanding requirements of the auto manufacturing environment, Matrox frame grabbers offer long-term functionality for unbeatable value.



## I/O Cards

Designed for maximum flexibility and scalability, Matrox's I/O cards support S.D., H.D., 3G and 12G SDI for SD through 4K/UHD resolutions. Built-in frame synchronization helps protect video input from potential damage in harsh manufacturing environments.

## Smart Cameras

State-of-the-art smart cameras extend scanning capabilities to reduce production defects, increase throughput and improve efficiency. Upgradeable features allow manufacturers to meet changing business needs by purchasing a simple software license.



## 3D Sensors

Fully integrated 3D sensors use laser triangulation to generate accurate representations of a scene or individual object. Matrox's high-powered sensors help prevent occlusion effects often encountered when using a single laser and image sensor.

## Vision Controllers

Matrox Imaging vision controllers combine embedded PC technology, expansion capabilities, and durability. Leveraging machine vision and deep learning, they offer an ideal solution for demanding single high-rate or multi-camera imaging applications.



Intelligent Edge  
Showcase

## Zebra and Matrox

With the acquisition of Matrox Imaging, a proven developer of advanced machine vision components and systems, Zebra expands its automated solutions to help organizations thrive despite workforce shortages or a limited supply of materials. Matrox Imaging allows manufacturers to automatically ensure final products are to spec and in compliance with ever-increasing customer expectations and ever-evolving regulations.

<sup>3</sup> Recall Masters, "Recap of 2021 Recalls Reveals Why the Decrease in Federally-Mandated Recalls Give Us False," May 5, 2022.

# Keeping Production Lines In Motion

As companies aim to hit higher production targets while also implementing lean manufacturing processes, speeding up lineside replenishment—while maintaining the highest level of accuracy—is critical. Implementing a materials management solution will minimize or eliminate errors that could potentially stop the production line, as partially assembled vehicles must be carefully stored, documented, and rescheduled for completion—wasting valuable time, space and resources.

Zebra's Real Time Location Solutions (RTLS) have revolutionized the traditional paper-based materials management process, eliminating the need for workers to walk replenishment routes and automating workflows to avoid over- or understocking of parts. With automated replenishment, supplies will be in the right place at the right time, and workers can flag discrepancies requiring corrective actions and keep the line moving.



## WherePort

Zebra's indoor or outdoor Ethernet-enabled exciters trigger asset tags as they pass through the field, capturing activity and status at critical work points, including entry or exit, shipping and receiving doors, repair depots, and final assembly. Multiple exciters can be connected to cover a larger area yielding maximum coverage with a cost-effective network infrastructure.



## WhereLAN

The locating and messaging hub of Zebra's RTLS uses advanced signal techniques to determine the time-of-arrival of an RFID WhereTag signal to subnanosecond resolution, resulting in up to one-m location accuracy.



## WhereCall

Fundamental to the material flow replenishment system, the WhereCall Tag can be easily mounted line side with no wires or conduit. It can make parts requests without requiring hardwired connectivity.



## L10 Tablet

Zebra's rugged tablets go everywhere the auto workforce needs to go. Configuration options ensure every employee has the right device for the job and clearly instruct operators where they need to go and what they need to do, with the option of integrated scanning to capture barcode data anywhere.



## DS3678 Handheld Scanner

Zebra's extended-range handheld scanners enable drivers to read far-away barcodes, which are partially obscured or damaged. Rugged exteriors stand up to drops, heavy use, and extreme environments.



## CartConnect100

CartConnect100 autonomously picks up and drops off FetchCarts to any location. Users employ devices to execute workflows, request a pick up and select a drop-off location. The nearest CartConnect robot automatically moves to the pick-up area, docks with the loaded FetchCart, and autonomously transports materials to the chosen drop-off area.



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## MotionWorks Material

MotionWorks Material eliminates disjointed, labor-intensive processes and provides material handlers and other members of the value chain access to actionable insights from the factory floor. With this immediate visibility, reliable communication, and real-time measurability, the workforce can focus on delivering the necessary parts without unnecessary movement.

# Real-Time Visibility from Raw Materials to Finished Vehicles

In today's fast-paced auto industry, manufacturers need a holistic view of what is going on across the supply chain. By capturing real-time data, companies can gain actionable insights to control quality better, streamline processes, optimize production, and ensure visibility for recalls. Greater inventory accuracy translates into more availability and fewer Work in Process (WIP) vehicles held up due to a shortage of individual parts or components.

With the integration of Zebra technology, including sensors, readers and scanning technology, facility management can identify underperforming suppliers and uncover workflow bottlenecks. Organizations can easily create a complete record of every product as it moves through every step of the facility. With the right solutions paired with the right tasks, teams are empowered with the ability to anticipate shortages, schedule around delays, and minimize factory floor downtime.



## ZT620 Industrial Printer

Zebra's range of durable printers can stand up to high-volume production needs, day in and day out, with precise and reliable print quality and speed across the broadest range of applications.



## MC3300ax Mobile Computer

Zebra's multi-use, multiple form factor key-based, handheld computers offer unmatched versatility and flexibility for warehouse and manufacturing deployments. Rugged design and long-lasting battery life help these devices go the distance.



## FX9600 Fixed RFID Reader

Enabling faster and more accurate supply chain traceability, fixed RFID readers guarantee an updated status for each tagged product or part as it travels throughout a facility.



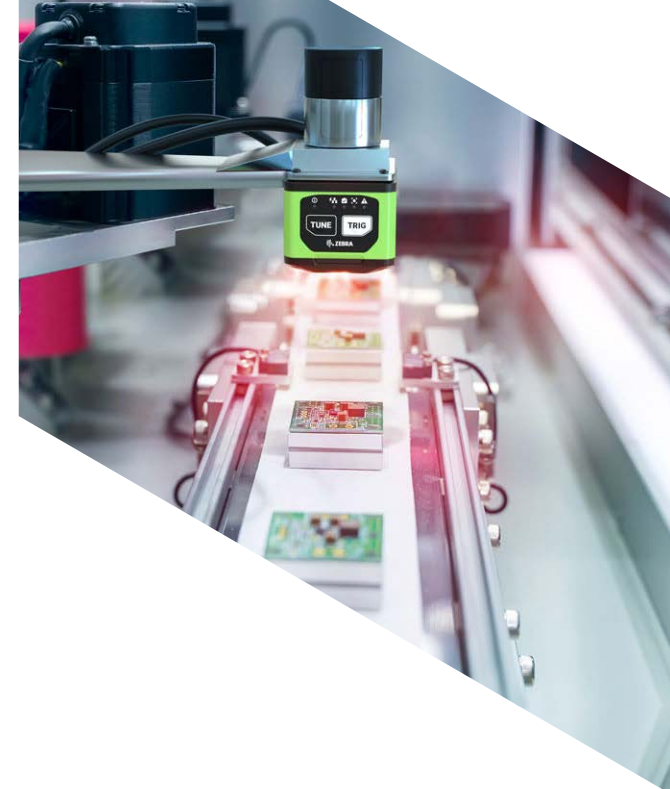
## Fixed Industrial Scanners (FS10, FS20, FS40, FS70)

Zebra's Fixed Industrial Scanners (FIS) provide trusted decode performance to automatically track and trace items from production through distribution. Identify every part and package with a model for every application, and upgradeable features allow you to meet the evolving needs of your business.



## AN510 RFID Antenna

The AN510 offers powerful connectivity for high throughput, high-capacity communications. Despite a sleek and low-profile design, it offers durability in any industrial environment, including outdoors.



# Maximizing Spare Parts Distribution

The auto spare parts market includes door panels and bumpers to fuel injectors, windshield wiper blades, brake pads and more. Spare part supply chains have gotten more complex with the digital era, including dealerships, independent retailers, mass-market retail chains, and e-commerce storefronts selling a vast assortment of individual SKUs direct to consumers online.

Parts need to be distributed with the efficacy of a top-notch e-commerce solution. With Zebra's warehouse solutions, organizations can process parts more quickly and get them to where they need to be—either on the line, with dealer repairs, or distribution—with little to no downtime. Efficient inventory tracking can also help brands respond quickly to recalls and unforeseen market disruptions, such as a spike in demand for used vehicles or potential future legislation regarding electric vehicles.



## Wearable Devices (WS50, WT6300, RS5100)

Equipped with wearable technology, workers can quickly fill orders following instructions on a graphical interface. The Bluetooth® wearable ring scanner empowers hands-free operations for faster picking and packing of orders.



## Tablets and Mobile Computers (TC72/TC77, MC3300ax, MC9300, TC8300 DPM, ET80/85, L10/L10ax, VC80x)

Zebra's rugged tablets offer employees the computing power and large touchscreens they need to monitor and control operations from a single pane of glass. Vehicle-mounted devices give forklift operators access to work orders and inventory data. Mobile computers allow workers to run essential applications and manage workflows while on the move.



## Scanners (DS3600-SR/DS3600-ER/DS3600-DP)

Precise and durable scanners ensure frontline workers capture the correct

information as they complete tasks and move through the warehouse. Zebra's hot-swappable batteries guarantee accurate asset tracking without the threat of a dying device holding them up mid-shift.



## Printers and Supplies (ZQ630, ZT610, ZT411)

A lineup of Industrial printers, mobile RFID and barcode printers, and color-coded labels help frontline workers stay organized, highlighting essential information about each part as it moves to the next destination. Zebra's mobile printers offer the highest level of connectivity in addition to a high-capacity battery.



## AMRs

Zebra's Autonomous Mobile Robots (AMRs) help transport tools, components, supplies, and other necessities for production across the facility. Automating these time-intensive tasks means workers spend less time waiting or walking around and more time on the activities that require their attention and expertise.



## Supply Chain Challenges Persist

The growing average age of vehicles in operation in the U.S. was estimated at 12.2 years, growing annually over the past five years.<sup>4</sup> Supply chain shortages and production bottlenecks have prevented some consumers from upgrading their vehicles, while others simply choose to wait and repair existing vehicles rather than upgrade. A wider variety of cars on the road means manufacturers must keep a wider variety of spare parts in production and distribution.

<sup>4</sup> S&P Global Mobility, "Average Age of Vehicles in the US Increases to 12.2 years, according to S&P Global Mobility," May 23, 2022.

## Helping Manufacturers Thrive in Uncertain Environments

The auto industry includes complex retail and service networks, made even more complicated by market disruptions and the growing demand for electric vehicles. While times of market transformation create uncertainty, they can also generate new opportunities for forward-thinking businesses to win in a new landscape.

At Zebra, we lead the development of intelligent, enterprise-technology solutions that provide unrivaled visibility into what is happening across your business. Our vision is to help automakers leverage technology to prepare for near- and far-future situations. For every stage in the manufacturing process, our global partner channel strategy provides a strategic level partnership while delivering local consulting, hardware, services, and supplies for each step in the automotive supply chain.



Data Communications Management Corp.  
9195 Torbram Road, Brampton, Ontario, L6S 6H2, Canada

[technologyinnovation@datacm.com](mailto:technologyinnovation@datacm.com)  
<http://datacm.com>