ZEBRA CAPTURE YOUR EDGE

Intuitive Machine Vision Solutions for Today's Warehousing and Logistics

Keep Pace with Modern Logistics Demands with Automation

Warehousing and logistics environments today face increased pressure to keep pace with growing customer demands, particularly from e-commerce sales. In the wake of disruptions caused by labor shortages and the COVID-19 pandemic, businesses have increasingly turned to automation technologies as they look to improve speed, accuracy, cost effectiveness and ease-of-use requirements. Two of the "must have" automation innovations modern logistics environments require are the latest in barcode-reading sensors and machine vision cameras and software.

Automated barcode scanning and machine vision inspections

Several types of automation applications exist within modern warehouses, including key areas where Zebra Technologies has made it easier for manufacturers to improve operational efficiency. The first is **packing bench scanning.** In this application, fixed industrial scanners and print technology deliver hands-free code reading for quick and accurate decoding and verification of package labels. On the conveyor in scan tunnel applications, Zebra's fixed industrial scanners offer barcode reading and visual inspections in one device that helps increase tracking and sorting throughput with high-speed **scan tunnels** that guide packages to their proper destinations. Meanwhile, Zebra's connectivity gateway eliminates processing inefficiencies and allows all connected scanners or cameras to achieve top performance.

Forklift pallet scanning, another common warehouse application, is something that companies are increasingly deploying to ensure that the correct pallet is being loaded into a truck. By adding Zebra fixed scanners or smart cameras to the tines of a forklift, customers can turn their vehicles into intelligent, code-reading devices that eliminate manual scanning by delivering automated, accurate data-capture capabilities. Similarly, Zebra's **dock door scanning** capabilities, another key warehouse application, help customers keep pace with today's demands for volume and speed. In this application, two fixed industrial scanners are mounted in an arch on either side of a dock door—as opposed to the front of a forklift—for automatic scanning. Zebra scanners offer the required speeds, working ranges and resolution required to not only read barcode labels, but also ensure label presence, confirm correct or incorrect positioning and orientation, and verify that a label is in the correct location.

Zebra Technologies offers a complete range of fixed industrial scanning and machine vision solutions—including barcode readers, smart cameras, machine vision software, connectivity gateway technology, vision controllers, and frame grabbers—to address the challenges of modern logistics environments. For warehousing applications where its necessary to measure volume or confirm dimensions, Zebra's factory-calibrated 3D laser profilers simplify the process of performing these verifications by generating a surface map and producing width, length, height, and volume information in real-world units (millimeters). This comprehensive guide looks at four key automation applications in warehousing that rely on Zebra technology to reduce read errors and misloads, improve loading productivity, increase visibility into conveyor routing and ultimately improve overall operational efficiency and shipping volumes.

Warehousing Quick Reference Guide

Described within this guide are four key machine vision applications that modern logistics environments rely on to handle the speed, accuracy, cost effectiveness and ease-of-use requirements to keep pace with customer demands. Within each category are details and highlights of these applications, followed by a list of Zebra products that deliver automated imaging capabilities that today's logistics and warehousing environments need to enhance efficiency, increase shipping volumes and drive revenue.

Packing Bench Scanning

Applications: 1D and 2D barcode reading

Solutions: FS10 fixed industrial scanner; FS40 fixed industrial scanner; Zebra Aurora Focus™ software; Zebra printers; Zebra mobile computers

Highlights: Accurate high-speed code reading, visible and audible success decode cues, linerless and other print technologies, plus an on-board Human Interface Device (HID) keyboard for translation.

Scan Tunnel

Applications: 1D and 2D barcode reading; package completeness inspection; label verification; order picking optimization; connectivity gateway data aggregation

Solutions: FS40 fixed industrial scanner; VS40 smart camera; GS20 connectivity gateway; Iris GTX smart camera; CV60 machine vision camera; 4Sight industrial vision controllers; Aurora Focus software; Zebra Aurora Design Assistant™ software

Highlights: Zebra delivers cost-effective modular code reading, distributed and centralized computation options, with barcode reading and machine vision tasks centralized in one device, and a connectivity gateway to remove processing inefficiencies.

Forklift Scanning

Applications: 1D and 2D barcode reading; label verification; missing or misplaced logo detection; stray print detection

Solutions: FS40 fixed industrial scanner; VS40 smart camera; Zebra mobile computers; Aurora Focus software

Highlights: Rugged and reliable hands-free scanning, barcode reading and machine vision inspection capabilities contribute to improved loading efficiency and shipping rates.

Dock Door Scanning

Applications: 1D and 2D barcode reading; label verification; missing or misplaced logo detection; stray print detection

Solutions: FS40 fixed industrial scanner, VS40 smart camera, Aurora Focus software, or CV60 machine vision camera, 4Sight vision controllers and Zebra Aurora Vision Studio™ software

Highlights: High-speed code reading with working range options, barcode reading and machine vision inspection capabilities for improved loading efficiency and shipping rates—all available with Zebra Technologies.

Packing Bench Scanning

Efficient, Ergonomic Fixed Scanning

Packing bench stations—where items are placed into boxes or packages and labeled before shipping to customers—can become quite hectic in busy warehousing and logistics environments. Labor shortages and increasing customer demand in e-commerce businesses have put more pressure on packing teams than ever before. In many conventional setups, employees would retrieve a box, scan the barcode using a handheld scanner, manually peel and affix a shipping label, and then place the box onto a conveyor for shipping.

Zebra packing bench solutions are fully optimized for modern logistics environments, delivering a faster and more streamlined experience. An employee places the box under a fixed FS10 or FS40 scanner, which will flash green and beep, providing visible and audible cues for successful decodes, allowing the employee to work up to 33% faster than in conventional situations.

Warehouse environments today need solutions that are fast, effective and easy to use. Zebra's FS10 and FS40 fixed industrial scanners are plug-and-play devices that can be plugged into the USB port of a workstation, laptop, tablet or other host device—without need for converting cables—to begin capturing barcode data immediately using Aurora Focus software. In addition, the software's intuitive interface can be used by beginners and experts alike, allowing companies to improve overall operational efficiency and reduce deployment time, costs, shipping errors and delays that would impact customer satisfaction.

Rugged, Reliable Printers and Built-In Translation

Every second counts when it comes to maintaining a fast, efficient pace at the packing bench. Zebra's packing bench solutions utilize linerless print technology, which allows workers to print multiple label sizes from one device while eliminating the need for a worker to peel labels—saving valuable seconds on every pack. Zebra linerless printers help cut costs by eliminating trailing label media, which reduces waste for a greener workplace. In addition, Zebra offers a range of other print technologies that are widely deployed in warehousing applications today, including thermal and desktop models for printing shipping and receiving labels, pick and pack labels, pallet labels, RFID tags, packing slips, asset labels, and more.

Another cost-saving feature offered by Zebra for packing bench scanning applications is an HID keyboard offered in Zebra Aurora Focus software that translates acquired data into several different languages, removing the need for a third-party device to translate the default English keyboard into another language. By enabling this feature in the software, the job/output streams over a USB connection to the host PC as if the device were the keyboard.

> Zebra's FS10 and FS40 fixed industrial scanners and Aurora Focus machine vision software simplify the deployment and operation of automated packing bench scanning applications, which include audio/visual cues and on-board translation for successful decodes for fast-paced environments.

Scan Tunnel

Barcode Reading and Visual Inspections in One Device

In modern logistics environments, scan tunnels improve tracking and increase sorting throughput. Scan tunnels utilize high-speed fixed industrial scanners, machine vision cameras or smart cameras to capture barcodes that are then decoded by software to verify product information, helping to guide packages of various sizes and shapes to their destinations. Zebra's barcode solutions make it easy to quickly integrate 1D and 2D barcode reading, data capture and simple machine vision inspection to enhance overall operational efficiency and perform quality checks such as such as package integrity inspection, and label presence and verification including robust character reading.

Because individual customer needs vary, Zebra offers distributed or centralized computation options that can be customized to a company's unique requirements. With integrated lighting, multiple connectivity options, Aurora Focus software support and a comprehensive set of features for track and trace applications, the FS40 fixed industrial scanner offers a cost effective, intuitive option for scan tunnels. In addition, a single FS40 can perform barcode reading and visual inspections as well as capture barcode and character data in the scan tunnel, in one integrated device. For example, the scanner can have its software upgraded to enable it to detect missing or misplaced logos, stray print and other label defects by counting the number of pixels within a specified region of interest that fall within a certain intensity range, which helps verify label quality as well as capture barcode data in the scan tunnel.

Customers can also deploy Iris GTX smart cameras running Aurora Design Assistant software or CV60 series machine vision cameras combined with Zebra frame grabbers and a 4Sight industrial vision controller running software from the Zebra Aurora™ software suite.

Next Generation Scan Tunnel Architecture

In today's scan tunnels, one camera or scanner is designated as a "leader" device, which coordinates and communicates with the other "follower" devices in the tunnel. In this setup, all cameras capture barcodes, process data and send it to a designated leader module, aggregating all captured scan data and quickly sending only the information required by the host application.

By deploying the GS20 connectivity gateway—which supports up to 16 cameras or scanners—all other imaging devices in the tunnel can act as single-purpose devices and capture barcodes. Deploying such a device eliminates processing inefficiencies and allows all cameras or scanners to achieve maximum scanning capabilities. In addition, the GS20 requires no coding or technical expertise for setup and offers a rugged dustproof and waterproof design.

Whether customers prefer a distributed or centralized computation approach, Zebra has a range of options for high-speed scan tunnel applications, including the FS40 fixed industrial scanner, Iris GTX smart cameras, CV60 machine vision cameras, GS20 connectivity gateway, 4Sight vision controllers, Aurora Focus software, and Aurora Design Assistant software.

Forklift Scanning

Hands-Free Pallet Scanning

Before loading pallets of goods onto a truck for shipping, workers must ensure that the correct pallet is being loaded into the truck from the forklift. A conventional setup may involve a forklift driver navigating to the truck and scanning the pallet either from the seat or directly in front of the pallet using a handheld device. Advancements in automation technologies, however, have streamlined this process.

A common automation application in warehouse loading operations today, forklift scanning systems provide hands-free scanning capabilities. A typical setup may involve two fixed industrial scanners mounted on the front of the forklift between its tines, acting as the eyes of the vehicle. When the forklift approaches a pallet, the scanners automatically scan labels and transmit the captured data to the forklift's onboard computer, saving significant time, reducing read errors and misloads, and improving loading efficiency and shipping volume.

Rugged, Reliable Track-and-Trace Options

Systems integrators and OEMs have a range of options when it comes to choosing the right fixed scanner or smart camera for forklift scanning applications, including the rugged IP67-rated FS40 fixed industrial scanner, which is housed in industrial aluminum with reinforced plastic. FS40 scanners offer Aurora Focus software support, an intuitive interface, an integrated LED array, and one M12 cable for power and I/O to minimize the risk of cable snags on the forklift.

Zebra VS40 smart cameras can also be deployed in forklift scanning applications to fulfill the same needs, while also offering additional machine vision capabilities These include missing or misplaced logo detection, stray print detection and label verification tasks. In addition, the FS40 scanners can be transformed into smart cameras with the addition of a software license, adding machine vision capabilities without having to purchase a separate device.

Zebra's rugged FS40 fixed scanner, VS40 smart camera, and Aurora Focus software deliver barcode reading and simple machine vision inspections in one device, saving time and increasing accuracy when it comes to automated code reading.

Dock Door Scanning

Automated Scanning Archway

Like forklift scanning, dock door scanning provides modern logistics environments with a means to efficiently and effectively automate the process of ensuring that the proper pallet is being received, moved or loaded from an inbound vehicle or into an outbound truck. A typical dock door scanning setup essentially inverts the forklift scanning application, mounting two fixed industrial scanners in an arch on either side of the door—as opposed to being mounted on a forklift—for automatic scanning.

When the forklift enters through the doorway, the fixed scanners capture barcode data at high speeds, and the data is relayed to the forklift's onboard computer, which confirms that the correct pallet is being sent off for shipping. Instead of an operator having to stop and manually scan barcodes—which slows the process considerably—the vehicle can keep moving the pallet into the truck, and the automated system accurately scans the labels, ultimately saving time and increasing shipping output. In addition, the barcode scanners are programmed to scan for codes in a specific region of interest, avoiding any erroneous scans from pallets outside that specific area.

Accurate, High-Speed Code Reading

Reading barcodes on a pallet while a forklift is in motion requires a high-speed fixed industrial scanner. Zebra's FS40 can process up to 16 different images simultaneously at frame rates up to 60 frames/second. Should the application require it, Zebra Barcode+ software tools can help ensure label presence, confirm correct or incorrect positioning and orientation, and verify that a label is in the correct location.

The FS40 offers a robust design, onboard lighting and a single cable for power and I/O which simplifies installation. For dock door scanning and all other warehouse applications, the FS40 scanner can also be transformed into a smart camera with the addition of a software license, adding machine vision capabilities without having to purchase a separate device. While the FS40 offers the flexibility to customize this solution, dock door scanning can also be configured using Zebra CV60 machine vision cameras, a 4Sight series vision controller and Aurora Vision Studio, depending on the requirements of the environment.

Zebra's rugged FS40 fixed scanner and VS40 smart camera both support Zebra Aurora Focus software and feature a robust design with onboard lighting and one cable for power and I/O that suit varying dock door scanning needs.

Machine Vision and Fixed Industrial Scanner Solutions

FS Fixed Industrial Scanners

Zebra's rugged FS10 and FS40 fixed industrial scanners both support Aurora Focus software and feature a robust design with onboard lighting and one cable for power and I/O that suit varying dock door scanning needs.

Learn more

VS Smart Cameras and Sensors

Zebra's smart cameras are available with 1.2 to 5.1 MP image sensors. From scan tunnels to forklift or dockdoor scanning applications, smart cameras deliver fast, accurate imaging with powerful software support.

Learn more

Iris GTX Smart Cameras

Iris GTX smart cameras feature CMOS sensors ranging from 2 to 16 MP and substantial processing power in a compact all-in-one vision system. These devices deliver fast, high-resolution imaging for demanding warehousing applications including high-speed scan tunnels.

Learn more

Frame Grabbers

Zebra provides the industry's most comprehensive frame grabber lineup, ranging from entry-level models for very cost-sensitive applications to boards supporting single or multi source high-rate image and video acquisition and featuring pre-processing capabilities. With CoaXPress, Camera Link and GigE Vision options—plus video sources from SD to HD all the way to UHD, these frame grabbers suit packaging applications such as scan tunnels.

Learn more

Vision Controllers

Zebra vision controllers feature a unique combination of embedded PC technology, expansion capabilities, optimized size, and sturdiness, making them ideal solutions for demanding multicamera machine vision applications, such as high-speed scan tunnels.

Learn more

Machine Vision and Fixed Industrial Scanner Solutions

AltiZ 3D Sensors

AltiZ high-fidelity, high-speed 3D profile sensors feature a dual-camera single-laser design that minimizes scanning gaps at critical surface junctures. AltiZ 3D sensors can be reliably deployed in a range of packaging applications, including measuring volume and confirming dimensions.

Learn more

CV60 Machine Vision Cameras

The CV60 series of area scan cameras are built for vision systems featuring multi-camera configurations, such as high-speed scan tunnel applications. With several monochrome and color models to choose from, the GigE Vision CV60 series features high-resolution CMOS sensors with resolutions ranging from 2.3 to 12.3 MP.

Learn more

Connectivity Gateway

The GS20 connectivity gateway for scan tunnel applications substantially increases package tracking and sorting throughput. With support for up to 16 cameras, the GS20 aggregates all captured scan data to quickly send only the information required by the host application.

Learn more

Zebra Aurora Software

The Zebra Aurora suite of industrial automation software enables users of all experience levels to solve their track-and-trace and vision inspection needs in today's packaging applications, delivering control over all Zebra fixed industrial scanners and machine vision smart cameras, and simplifying management of enterprise-wide manufacturing and logistics automation solutions.

Learn more

Zebra
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PEAK
TECHNOLOGIES

peaktech.com
1-888-444-9128

ZEBRA

NA and Corporate Headquarters
+1 800 423 0442
inquiry4@zebra.com

Asia-Pacific Headquarters
+65 6858 0722
contact.apac@zebra.com

EMEA Headquarters
zebra.com/locations
contact.emea@zebra.com

Latin America Headquarters
zebra.com/locations
la.contactme@zebra.com