

Wireless Labeling Solutions for Retailers



A ZEBRA BLACK&WHITE PAPER





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Wireless printers are a viable cost-saving option for retailers and can be incorporated into an existing network effortlessly. This white paper introduces the applications in which wireless printers can be used, examines return-on-investment models, outlines the different types of wireless technologies that are available, and describes the options and benefits associated with wireless printing in retail environments.

Executive Summary

Wireless printing is now widely recognized by major retailers in North America and Europe as an essential technology for enhancing store operations. The ability to print real-time information in the aisle, on demand, saves time, effort, and money—contributing to the creation of competitive advantage.

Once a wireless network is installed, the benefits of wireless printing in-store become self-evident. Wireless printers mean that labels, coupons, receipts, or tickets can be printed on demand where they are used. Mobile printers are so compact that they are ideal wherever space is at a premium and could be better used.

Wireless technology enables retailers to put products on promotion at a moment's notice. It means that store associates can complete shelf price audits and re-labeling tasks within a very short time period. It means that store managers can be more confident of shelf price integrity—for fewer price checks at the register. It means that receipts can be printed as part of a mobile point-of-sale or customer line-busting solution.

These and other wireless printing applications can lower total in-store printing expenses, provide total cost of ownership (TCO) benefits compared with traditional printers, improve store efficiency, reduce store operating expenses, improve safety through the elimination of entanglement-prone cables, and increase customer satisfaction.

Read on to see the specific benefits this emerging technology can provide retailers, examine return on investment (ROI) models, and learn about your application and technology options.

Introduction

The cash register, the bar code, and the self-service kiosk all first proved their value in retail stores before going on to become mainstream productivity tools. Now, another emerging technology is ready to bring retailers new cost savings, operational efficiencies, and opportunities to improve customer service: wireless printing.

Wireless printers come in different sizes and shapes, from full-featured tabletop models to small, battery-powered mobile printers that may be clipped to a belt, or carried over the shoulder or by hand. These mobile printers have characteristics that are perhaps more valuable to retailers than to any other industry, since they include a smaller footprint, the flexibility to safely move to where printing is needed, improved aesthetics, lower maintenance costs, and improved safety and productivity. Additionally, there is a whole new subset of solutions in which users can take non-wireless printers, connect them to a wireless print server, and mount them on a cart for a highly efficient means of wireless mobile printing.



This white paper illustrates how you can improve your business with wireless printers by:

- Providing cost-benefit analysis tools to help you see the value in wireless printing and uncover the hidden costs of your current printing operations.
- Providing a complete overview of wireless printing capabilities.
- Helping you select the best solution by understanding printer types, features, communications methods, and media, which include price tags, labels, and receipts.
- Showing how retailers can optimize their printers by using the equipment for multiple tasks in the back office and front of the store.

“Wireless printers” refers to printers in which a wireless local area network (WLAN) or Bluetooth® (BT) interface is used either to connect the printer to the network, to a controlling PC or hand-held computer, or both.

What Benefits Can You Achieve by Going Wireless In-Store?

Real-Time Data Anywhere

Mobile computing promises access to the network anywhere, and this enables authorized in-store users to access critical information on the sales floor, such as inventory levels and Price Look Up (PLU). Much of that data needs to be printed immediately—as is the case with pricing labels. Oftentimes there are process delays associated with waiting for those printed labels, either because they are printed in the backroom, or because they will be delivered at some point by an outsourced vendor.

Price Integrity

Retailers already struggle to maintain pricing integrity between the label on the shelf or the product, and the PLU database. It is this database that is accessed by the point-of-sale system when the symbol is scanned at the checkout. But now there are very serious legal and public relations threats with which to contend. News is all too common of civil actions against chains over discrepancies between prices displayed on retail shelves and prices charged at the checkout. Retailers, who already struggle to maintain pricing integrity for customer satisfaction, now face legal risks.

Fortunately, retailers also have a new tool at their disposal to detect and correct potential pricing errors: wireless price look-up devices with on-the-spot label printing. There are two systems retailers can deploy to enable price integrity: shelf price audits with on-the-spot label printing, and price verification kiosks.

In both systems, when the UPC/EAN symbol, either on the product or the shelf, is scanned, a price look-up is initiated in the PLU database, which transmits price information back to the computer screen. The same PLU database is accessed by the point-of-sale system when the bar code is scanned at the checkout. By working from a single database, errors are eliminated. Data latency and unsynchronized systems are leading causes of checkout errors—and it’s these errors that lead to customer dissatisfaction and lawsuits.

Add Value to Your Wireless Infrastructure

Installing a wireless network across a retail organization is a significant investment, and therefore adding applications to an existing wireless infrastructure can boost the return on investment. For example, adding real-time price labeling capability to their wireless network has provided major retailers proven ROI in remarkably short periods.



Improved Productivity

Using a mobile printer interfaced wirelessly to either a hand-held computer or to a host computer in the back office, workers can receive data to print shelf labels and in-aisle promotional flags at the precise location where they are needed. This ensures labels are placed in the correct location and eliminates trips to the back of the store to pick up printed labels.

Wireless Printing in Practice: One retailer with 50 stores studied the time required to conduct shelf labeling using a laser printer in the back of the store. The retailer soon converted to wireless mobile printers, used in the store. It learned that an average of 30 minutes are wasted walking back to retrieve labels and waiting for them at the busy printer. By multiplying the time wasted by the number of shelf price changes, the retailer discovered a loss of 182.5 hours per store each year to wasted effort. At an average cost per associate of \$10 per hour, they were wasting \$91,250 each year.

Reduced Media Costs

Mobile printers use thermal print technology. Thermal labels are less expensive than laser printer labels. And producing labels on demand eliminates waste from partially used laser sheets. In addition, when laser media is used, there is an additional labor cost in the time it takes to separate the individual printed labels from a complete laser sheet-and to identify the product that matches each price label.

Wireless Printing in Practice: One leading European retailer estimated that its store staff spent up to two hours per day separating and sorting laser-printed shelf edge tags before they could be applied.

Wireless Printing in Practice: A pharmacy chain that makes an average of 300 weekly SKU changes per store compared the cost of producing shelf labels with a laser printer and with a wireless portable thermal model. The chain justified the purchase of mobile wireless printers by a saving in media costs of more than \$3,000 per store per year. The mobile units provided a lower total cost of ownership, and the pharmacy realized a full return on investment in less than four months.

Reduce Printing and Labeling Expenses

Wireless printers enable retailers to reduce their ongoing printing and labeling expenses while improving customer service and the productivity of their floor staff. This is achieved by converting to wireless selected equipment currently used for generating printed material, such as fixed-station, tabletop shelf label printers, shipping label printers, receipt printers or pricing guns, and coupon stations.

Reduce Costs of Repair, Implementation, and Replacement

Eliminating cables does more than improve user convenience, productivity, and safety. It removes an expense that significantly adds to the printer's cost of ownership over time. A survey of store associates at one retailer indicated that two minutes per day per terminal/printer system were devoted to troubleshooting cable-related problems. For a 50-store chain, this equates to 4,500 hours of non-productive labor annually. At an average rate of \$12 per hour, managing cable issues can cost the retailer upwards of \$50,000 per year.

Retailers lose millions of dollars every year because of workplace injuries, so improving workplace safety is in everyone's best interest. Wireless printers can improve retail safety on the store floor and in the backroom by eliminating unnecessary cords and cables. The lack of cables also creates flexibility for retailers who often change the setup of their stores, as running wires can be a costly endeavor.

Easy to Deploy and Use Across a Store Network

Best of all, wireless printers are easy to deploy and use. Some existing tabletop printers can be wirelessly enabled through expansion cards or modems without compromising quality or features. New models with native wire-

less support are available to meet a variety of needs. There are an impressive number of product choices in the mobile category. Both tabletop and mobile models support multiple wireless standards, ensuring compatibility with existing wired and wireless network infrastructures.

In Which Ways Can You Use Wireless Printing?

Wherever an item moves, or wherever goods are received or information displayed, that’s an opportunity for on-demand labeling with real-time price, product, or inventory information. Wireless printers are used by major U.S. and European retailers for on-demand labeling in all aspects of the store, whether it be item or shelf marking, signage, transfers, or returns.


Below are some examples of how these leading retailers are using wireless printing technology today to create competitive advantage and improve operational efficiency.

Summary	Description
Back of Store	<ul style="list-style-type: none"> • Stores can label goods received or print routing labels to indicate shelf location. • Product identification labels for unlabeled goods can be printed.
Pharmacy	<ul style="list-style-type: none"> • Thermal is the print technology of choice for dispensed drug labels.
Price	<ul style="list-style-type: none"> • Product labels produced on demand in the aisle include: <ul style="list-style-type: none"> » Markdown labels in apparel, discount, outlet, or closeout stores. » Fresh food product, price, or markdown labels. » Promotional labels. » Labels for customers to print from price verification kiosks.
Item	<ul style="list-style-type: none"> • Bar coded product labels need to be produced on demand in-store for products cut to size (e.g., fabric or timber), parts, and small items such as jewelry. • Stores need the capability to print replacement labels for apparel and soft goods when the original is damaged. • Hard goods stores have many unique requirements, such as appliance information labels, plant pot spears, and Tyvek® wraparounds in garden centers, or hang tags that can be customized to promote your brand by Zebra’s Supplies department.
Returns	<ul style="list-style-type: none"> • Merchandise returned in perfect condition can be re-labeled on the spot. • Shipping labels for inter-store transfer or return to the distribution center can be printed on demand.
Shelf	<ul style="list-style-type: none"> • Multi-color, branded shelf edge labels or tags can be printed with bar codes and price details to slide into plastic shelf ticket holders. • “Shelf talkers” or small signs can be printed with merchandise messaging. • “Out-of-stock” shelf labels are required in stores where inventory is managed at the store level, often in the hard and soft goods retail sector.

Which In-Store Processes Are Improved by Wireless Printing?

Shelf Price Audit and Labeling Process

Producing in store labels and promotional flags with wireless mobile units, instead of centrally located printers, can save retailers thousands of dollars per store location annually through **improved productivity** and **reduced label and tag costs**.



Store associates can audit shelf price accuracy by using a mobile computer with a bar code reader. The same price that will be charged at the checkout is then displayed on the mobile computer. If the price displayed on the computer differs from the price on the shelf label, the associate can instantly print and place a new, accurate shelf label.

Following are the benefits of wireless shelf price audits with on-the-spot label printing:

- Price updates made to the central database are **instantly communicated** throughout the store, ensuring a consistent customer experience.
- **It eliminates the lag time** that occurs between new shelf labels printed at a central printer and the point when an associate collects them for distribution.
- **It eliminates labeling errors** when an associate loses or misapplies shelf labels.
- It helps preserve **customer loyalty and satisfaction** through accurate pricing and the resulting reduction in delays at the checkout.
- It **protects the store from lost revenue** when pricing errors are in the customers' favor.


Price Verification

Price verification kiosks prevent in-store pricing errors and also provide customer convenience. Shoppers use the kiosks to scan the UPC/EAN bar code on items to get an accurate price check. The kiosk then prints a price label for the product, which increases consumer confidence and also often eliminates the need for stores to print and apply price labels for each item.

The Commonwealth of Massachusetts in the United States recently amended its retail pricing laws to allow price verification kiosks with label printers as a substitute for individually marking items with a price label. While not all customers will want a label, the law mandates that they must have the ability to print one out.

Following are the benefits of wireless price verification kiosks with on-the-spot label printing:

- **Flexible location:** Being wireless, the kiosks can be relocated anywhere in the store with minimal disruption.
- Being wireless, the kiosks can be located anywhere with **low installation costs**.
- **Customer satisfaction:** By printing labels at the kiosks, customers will know how much the value of their basket of goods is, without going back to check each shelf label.
- **Time savings for associates:** Kiosks give consumers the convenience of being able to check prices or find items in the store without seeking out store associates.
- **Legal compliance:** Price verification kiosks are an important safeguard against the high costs associated with legal actions. Other U.S. states are currently considering laws similar to that passed in Massachusetts.



Price Changes and Item Labeling

Wireless mobile printers can also be used to create new shelf and item labels for planned or instant price changes.

Improvement to the Process of Re-pricing the Store: Daily or weekly price changes can be loaded into a hand-held computer with software that plans the most efficient route for workers to manage the aisles. The mobile printers are used to create new shelf or item labels and wirelessly send a confirmation to the pricing database.

Instant Price Changes Enabled: The wireless network can be used also to send messages or alerts notifying associates of price changes at any time during store hours and directing them to the aisle location to create new labels. The two-way wireless connection enables the associate to send a confirmation when the new price label has been placed, so the new price can then take effect at the point of sale.

Wireless Printing in Practice: One retailer with an average of 1,000 weekly price changes eliminated a 20-person, six-hour night shift after switching to mobile wireless printers to create new shelf labels and price audits. Now, a smaller team completes the same work in just one hour before the store opens. Total man hours for the operation were reduced from 120 to just two to three.

Wireless Printing in Practice: Using mobile printers to create new shelf and item labels can also eliminate the need for price sticker guns, or “marking guns.” A retailer that used an average of 25 marking guns per store reduced annual price marking expenses by \$1,715 by replacing marking guns with wireless mobile printers. Using the printers for other applications leverages your investment and results in an even faster ROI.

Returns Processing

Wireless printers add convenience and security to returns processing operations, both in the back office and on the retail shop floor.

Security and customer convenience can be improved by using wireless mobile printers on the retail floor. If your stores use a centralized returns area or customer service counter, thermal printers can create returns slips with quality logos, graphics, and security indicia, including two-dimensional (2-D) bar codes.

Roaming store associates can **process returns anywhere** when they have a mobile printer. Customers with returns can be intercepted as they enter the store, providing speed and convenience for them and store associates.


Returns can also be accepted in **outdoor retail areas** or even the parking lot, which is a great advantage for bulky or high-volume items. As with a mobile POS, mobile returns processing shortens lines (or queues) before customers run short on patience.

Shipping & Receiving

Bar code label printers are needed at the back of store for:

- Labeling unlabeled goods before they are put out for sale.
- Printing routing labels that indicate where received goods should be stocked in the store.
- Handling shipments inter-store or back to the distribution center.

Using wireless printers in the backroom gives you the flexibility to place the **printers wherever they are needed**, eliminating the need for workers to walk from the work area to the computer area to pick up labels. This is



especially useful when shipments arrive and need fast breakdown and putaway. Labels can be printed and applied on cases to direct associates to the exact shelf or rack location where the stock should be stored.

Printers can be moved freely and new printers can be added to the network **without incurring the time and expense of rerouting or installing new network cable.**

Wireless printers can easily be networked to a host computer located elsewhere in the store, which **eliminates the need for a dedicated PC** at the labeling area altogether. Print jobs can be directed from the same wireless mobile computer used for scanning incoming goods, checking in-store inventory, and executing shelf price audits.

What is Wireless Printing Technology?

In traditional configurations, the printer is physically connected to either a host device (usually a PC for tabletop printers and a hand-held computer for mobiles) or to a local area network (LAN). Connection to the host is through a cable, and connection to the network is by network cable. In wireless printing, the cable or network connection, or both, is replaced by a wireless interface. There is no loss of functionality when the physical connection is replaced by a wireless one. Different wireless interfaces are available and are selected based on the application and required performance.

Bluetooth Technology

For cable replacement applications, Zebra recommends Bluetooth connectivity. The printer and host device (usually a hand-held computer, but sometimes a PC, digital scale, or other device) must each be Bluetooth-enabled. Data transmission range can be up to 30 ft/10 m.

Bluetooth was developed as a wireless personal area networking (PAN) technology designed to allow computers, printers, and other devices to interface with each other in peer-to-peer networks without going through a centralized hub or server. Because of this, Bluetooth is ideal to use in applications that are “outside of the four walls” (away from a fixed wireless infrastructure—i.e., store network), or in smaller retail store environments where investment in a fixed RF infrastructure is prohibitive. Bluetooth coexists with 802.11b and other common wireless networks.

802.11b and 802.11g

Printers can now be networked wirelessly with their own IP address via 802.11b/g. Printers on a wireless 802.11b/g network have an IP address and appear like any other device on the network, wired or wireless. The wireless network includes antennas that provide coverage throughout the building, and base stations to process transactions. In wireless networks, printers, portable computers, and other devices are the clients and the base station is the server. The base station is usually integrated into a wired network providing access to the complete IT system. In all wireless applications, data transfer rates decrease as range and the number of users increase. Speed and coverage may be improved by adding repeaters and additional antennas to the network.

802.11b is the most widely used standard and offers performance sufficient for most retail needs. It allows up to 11 Mb/s (megabits per second) data rates.

802.11g is fast emerging as the standard wireless technology in retail. It operates on the same 2.4 MHz frequency band as 802.11b. This means that it is backwards compatible, yet allows for faster data transfer at up to 54 Mb/s. This means that with 802.11g, users can send more data in less time. In addition, advanced encryption and authentication techniques are available for extra data security.

Wireless Security

The value of data transmitted to and from wireless devices is increasing with time. Data, despite being intangible, has a high value to the organization, and therefore needs to be protected. In addition, organizations now have an increasingly legal obligation to keep customer, employee, and business data secure.

As a result of this trend, wireless security is becoming a far more important consideration to the buying center than previously. This is true of the leading retailers who implement advanced security techniques on their wireless LAN network installations.

Zebra® mobile printers are able to operate with the latest security protocols available, incorporating both encryption and authentication standards to protect sensitive data and maintain tight levels of security across the entire network.

For further detail on Zebra's approach to wireless security, please refer to the white papers on the wireless security page of Zebra's Web site, www.zebra.com/wireless_security.

Zebra Mobile Printer Connectivity and Security Options

	Cameo 2	Cameo 3	QL Series	QL Plus Series	RW Series	ZebraNet PS4000 Wireless Print Server
RS-232 Cable	✓	✓	✓	✓	✓	
USB Cable				✓	✓	✓
Bluetooth®	✓	✓	✓	✓	✓	
Symbol® 802.11b			✓	✓	✓	
Zebra Value Radio 802.11b		✓		✓	✓	
Zebra Value Radio 802.11g				✓	✓	✓
40 bit & 128 bit WEP	✓	✓	✓	✓	✓	✓
LEAP–Cisco			✓	✓	✓	✓
Kerberos– Symbol			✓	✓	✓	✓
VPN			✓	✓	✓	✓
WPA–PSK			✓	✓	✓	✓
WPA- EAP/FAST			✓	✓	✓	✓
WPA– EAP/TLS				✓	✓	✓
WPA–PEAP				✓	✓	✓
WPA–EAP/TTLS				✓	✓	✓
802.11i/ WPA2				✓	✓	✓





Wireless Printer Options

There are four types of wireless printers:

Tabletop—Fixed-station printers that sit on a countertop or cart and need external power. These printers are ideal when large numbers of labels are required at one time, or when the printer is in constant use in a particular place. These printers hold rolls of labels up to 450 ft/150 m long—and so can be used for long periods without changing media.

Cart (trolley) based—Printers that can be mounted on a cart (trolley). Cart-mounted printer solutions are valuable when a user needs a total print station for multiple requirements, such as batches of markdown tickets, signage, shelf tags, and other print jobs that require high-volume output or large media sizes at the point of application.


Kiosk-mounted—Price verification and other kiosks use touch-screen and scanner technology for self-service data input, and wireless label or receipt printers for printed output. Price verification kiosks offer the option to print price labels to assure the customer of price integrity at the checkout.

Mobile—Wearable, battery-powered printers that can be used clipped to the belt, hung from the shoulder, or carried with a handle. When choosing mobile printers, look for models that are lightweight, easy to use, and durable, and that offer outstanding print quality of text, bar code, and graphics. Balance, grip, and ease of carrying and operation should also not be overlooked.

Transportability as a Mobility Alternative – the Cart-Top Solution

All of the applications for wireless printing listed above can be achieved with mobile printers that increase the efficiency of your retail operations. But there is another alternative for performing these printing tasks wirelessly. Using the ZebraNet® PS4000™ wireless print server, up to four non-wireless USB 2.0 enabled printers can be made wireless and mounted on a cart (or trolley). By taking multiple, larger printers for in-aisle price marking, shelf labeling, mobile POS, signage, or other printing applications, and mounting them on a cart, a user can achieve multiple benefits.

- Firstly, there is the wireless enablement benefit. By “untethering” these printers, and allowing them to communicate to the store network wirelessly, you eliminate the need for costly and frustrating hard-wiring. When your retail store layout changes, you don’t need to rewire for all of your printers—because they are on a cart that can be pushed to a new location.
- Secondly, because the media capacity is larger on a multi-printer, cart-based solution than on a mobile printer, you eliminate the need to swap rolls when printing on different sizes, shapes, and colors of labels and receipts. Each printer can contain a different media roll—so that when you need to print a markdown label, you can use a printer with a label roll selected for that purpose...and when you need to print a shelf label, another printer is ready to go, with no need for roll changes.
- Thirdly, when an associate needs to hold merchandise, a handheld device, and a printer, it can be a bit cumbersome. Putting all of these devices on a cart frees the associate’s hands for other activities.
- Lastly, all four cart-mounted printers can share one IP address, allowing scarce IP-address resources to be used for other in-store wireless applications.



The ZebraNet PS4000 can be used with an LA-24 battery pack along with up to four Zebra Desktop series printers on a non-powered cart. Or, if you require larger printers, laser/inkjet printers*, or RFID printer/encoders, a powered cart can be used.

Using a cart-based application, you will find that printing tasks that used to be done sequentially can now be done concurrently, saving time and errors. By performing your markdowns, shelf labeling, and cycle counts in one sweep, you will save the time and cost associated with these activities.

A major apparel retailer installed over 400 PS4000 wireless print servers in late 2006 as part of its in-store wireless printing process. The solution was provided by SofTechnics of Akron OH. “Combined with Zebra’s broad line of printers, the ZebraNet PS4000 is a highly customizable solution,” said Erv Jones, marketing director at SofTechnics, Inc. “We can easily create an integrated cart-based solution that includes devices to meet our customers’ individual needs and provides the flexibility to change out devices as their demands shift.”

The ZebraNet PS4000 print server belongs to a suite of networking, software, firmware, and printer management tools designed to unlock the full potential of Zebra printers for ease of integration and most effective use by any size business. These ZebraLink™ Solutions include:

- **ZebraNet™ Bridge Enterprise printer management software**—Created to bridge the gap between label printer-specific support provided by printer utilities and the centralized management, configuration, and control available in general-purpose management applications. ZebraNet Bridge Enterprise provides comprehensive, centralized support for multiple printer and multi-site customers.
- **ZebraDesigner™ and ZebraDesigner Pro label design software**—Windows®-based label design made easy. Created specifically for use with Zebra bar code printers, the ZebraDesigner software line delivers a unique level of access to the advanced features found on the printers.
- **Zebra Universal Printer Driver**—Enables bar code, text, and graphic output on Zebra printers directly from Windows applications. It’s available as a free download for Zebra printers and includes support for models with ZPL, EPL, and CPCL programming languages. Native fonts and bar codes are supported to ensure maximum throughput.

Power Management

How the printer manages its power supply is very important to overall battery life and application effectiveness. Battery life varies widely based on how the printer is used. Print volume, label size, the amount of wireless transactions, and other factors all affect how long batteries last before needing to be recharged or replaced. Users should test their applications to ensure that the batteries they use consistently perform as needed and will not contribute hidden expenses to the total cost of ownership.

Lithium-ion (Li-Ion) cells represent the latest in mobile battery technology. Though more expensive than either nickel cadmium or nickel metal hydride cells, lithium-ion cells offer the highest power-to-volume and power-to-weight ratio of the three. For example, in a typical printer application, a lithium-ion battery pack producing 7.2 volts has 30 percent more power than a nickel metal hydride pack, with half the volume and half the weight.



Media

Modern mobile printers accept a variety of label, tag, ticket, and other media for producing durable shelf labels, coupons, receipts and return slips, name badges, security marks, signs, and other labels. Gone are the days of portable printers that print only low-quality receipts that curl at the edges.

Specialized media for retail includes:

- Red-print thermal labels for price promotions.
- Labels with peelable adhesive for gift products.
- Durable, UV-resistant labels and tags for shelf edges.
- Weather-resistant labels for products displayed outdoors.
- Labels applied on top of other labels for markdown or updates, with permanent black adhesive that renders the previous label unreadable.
- Self-destruct labels that cannot be removed and applied to another product.

S u m m a r y

Wireless printing provides increased efficiency, safety, and flexibility that retailers can turn into lower operations costs and improved customer satisfaction. Retailers see an almost immediate return on investment after implementing wireless printing solutions. No one offers more wireless and mobile printers or has implemented as many wireless printing solutions as Zebra Technologies. Contact us to see how we can help you improve your printing processes and boost your profitability. Call +1 800 423 0442 (in North America) or +1 847 793 2600.

* Zebra does not provide technical support for non-Zebra devices connected to the ZebraNet PS4000.



Notes



Notes



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GSA#: GS-35F-0268N

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#13020L Rev. 7 (9/06)