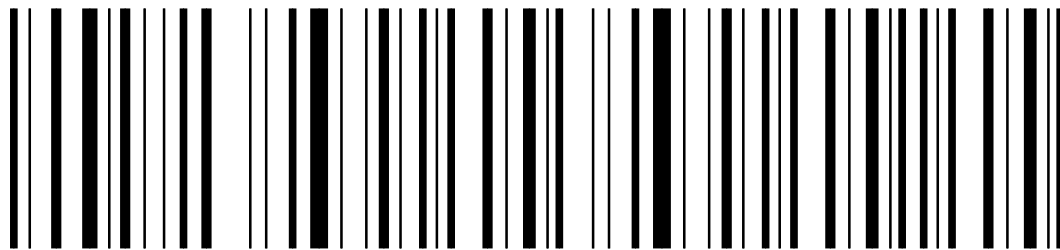


# Take a Total Approach to Maximize Mobile Printer Performance and Value



APPLICATION WHITE PAPER

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**Zebra Technologies**



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# I n t r o d u c t i o n

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There is much more to receipt and label quality than the logo on the printer. The output and performance of a printer is a function of its parts, its supplies, and how it is maintained. Just like a vehicle, mobile printers run better when they are well-maintained. By making smart choices—such as high-octane gas (Genuine Zebra® batteries and supplies), regular oil changes (maintenance), replacing the air filter when it gets dirty (parts and ZebraCare™ service)—you get the best performance, and ensure your investment will last. This white paper explains how media, printheads, batteries, and accessories impact mobile printer performance. You'll see why mixing and matching these components is a risky practice that can cause quality problems in the short term, plus excessive total cost of ownership (TCO) over time.

## M o b i l e T h e r m a l P r i n t i n g B a s i c s

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Zebra Technologies manufactures direct thermal mobile printers, which create printed output by using a printhead to apply heat directly to chemically treated labels. There is no ribbon or ink required. The printhead includes many tiny elements, which are turned on or off to provide precise image control. If the elements become blocked or damaged, spots or voids will appear and print quality will suffer. The amount of heat applied determines how dark the image appears. Precisely applying the right amount of heat is critical to print quality.

The heat setting must be matched to the specific media used with the printer, which underscores the need to think of mobile printing as an integrated system. Zebra has more than 1,000 different supplies choices for thermal printers, as well as expertise in creating custom materials. Supplies used in the printer must be carefully selected for the conditions the tag, ticket, receipt, or label will be exposed to, and carefully matched to the specific make and model of printer used. Because Zebra considers the heat settings and features when creating supplies for customers, the customer can feel confident that Zebra supplies have been developed and tested to optimize print quality.

Batteries should also be matched to specific printer models. General-purpose replacement batteries and charging systems don't support all of the advanced power management and safety features built into Zebra printers. In the worst case, replacement batteries and chargers could spark, catch fire, damage the printer, and invalidate the warranty. More commonly, they may have shorter life spans and may not hold a charge as long as printer batteries from the original equipment manufacturer (OEM). The bottom line is a generic or unknown battery may result in degraded or unpredictable printing.

Non-genuine-Zebra parts and accessories can also have unexpected, unintended effects on printer reliability. That's why printer warranties are often invalidated if non-approved accessories, supplies, or replacement parts are used. For instance, Zebra chargers are developed to intelligently monitor the charge level of the battery to avoid overcharge or undercharge conditions. For peace of mind and optimal performance, it's best to use components, supplies, and service from the OEM or its authorized suppliers. Doing so removes the worry and guesswork about what's best for the printer.





## Protecting the Printhead

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The printhead has the greatest effect on print quality and is also the most expensive replacement part. Because of this, taking good care of the printhead is integral to minimizing your total cost of ownership. Low-quality non-genuine-Zebra printheads can also cause more productivity problems than other components. While dead batteries can be swapped immediately or recharged; and media rolls can be quickly replaced, a printer can't be used until a damaged printhead is repaired or replaced. Mobile workers may be miles away from a replacement unit, so printhead failure is a serious risk for lost productivity and business disruption.

The most common printhead problems are burned-out elements and abrasion. Elements burn out after they become blocked by adhesive or particle buildup, which may be caused by using low-quality media. Some instances of this are cheap label supplies, where the dye in the paper leaves particles on the printhead or the sub-par adhesive leaves a gummy residue on the printhead. Printheads can also burn out if they consistently have to perform at high heat settings, which commonly occurs when the media is not well matched to the printer.

Abrasion occurs when dirt enters the printhead and when adhesives and particles from media fall off during the printing process. The particles harden from repeated exposure to heat from the printhead. After hardening, they grind and scratch, causing marks in the printed material and physical damage to the printhead itself. Abrasion can also occur if the label stock uses paper so rough that it actually acts like sandpaper against the printhead. In instances such as these, you may have saved some upfront money on your labels, but will pay in the end for the low-quality printouts and damage to the printhead.

Most buildup can be prevented by regularly cleaning the printhead with approved cleaning materials and techniques. Special solvents and applicators are available specifically for use with thermal printheads. These products are available from Zebra's supplies Web site ([www.zipzebra.com](http://www.zipzebra.com)). Additionally, from [www.zebra.com](http://www.zebra.com), you can download a free white paper, "Quality Assurance Steps for Preventing Label Printing Problems," which provides comprehensive insight into print quality problems and how to prevent them.

Even with the best care, the printhead will not last as long as the printer housing and other components. When the printhead has reached the end of its useful life, you don't need to replace the entire printer. The printhead should be considered a replacement part—albeit a critical one, like the brakes on a car. Because the printhead is such a key component, replacements should come directly from the OEM to ensure engineering and performance match the printer. An incompatible or inefficient printhead will cost much more in performance problems, maintenance, and quality than it might save in purchase price. Using a non-genuine-Zebra printhead in a Zebra printer invalidates the printer warranty. A non-warranty repair would result in real dollar expenses and significantly higher TCO than if Genuine Zebra replacement printheads had been used.

Service plans can take most of the expense and risk out of printhead lifespan. For example, ZebraCare service plans give customers the option of replacing older printheads at no added cost before there is a problem, which prevents lost productivity caused by equipment failure, and diminishing print quality.





## How Media Impacts Printer Performance

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The best way to protect printheads and extend their lifespan is to carefully select the material they will print on every day. Thermal printer supplies are a lot like wine—many varieties with subtle differences that impact the consumption experience. Wine from a \$50 bottle and a \$5 bottle can easily be poured into the same glass, just like high-quality and low-quality media can be loaded into the same printer. With wine, you might taste the quality difference immediately, and you'll certainly suffer more ill effects from drinking too much of the cheap stuff. You may or may not notice an immediate quality difference from using low-quality or incompatible media, but it certainly will cause a long-lasting hangover for your print system.

Poor-quality media is much more likely to flake, peel, tear, and leave adhesive residue—resulting in abrasion and blocked printhead elements. The most common short-term effects of a non-optimized printer-media combination are excessively light or dark output, fading, smudging, and tearing. Workers may also notice printer battery performance is diminished, because the printhead has to work harder to heat the media and is drawing more charge. In the long term, elements get blocked, leading to premature printhead failure.

Media must be matched not only to the printer make and model, but also to the specific printing and usage environment. Mobile printers can accept tags, tickets, labels, and forms in different sizes and thicknesses with different adhesives and a variety of protective coatings. Each combination of media, adhesive, and coating requires its own heat setting so the printer can efficiently provide the best print quality. Optimizing media for the printer and application is a specialized skill and shouldn't be left to a chance selection from a catalog or recommendation from a general-purpose supplier. To select the best media for your printer and application, we recommend you either work with a Zebra authorized partner or contact the Zebra supplies department.

The Zebra Complete™ program is a convenient way to get a cost-effective combination of mobile supplies and service to ensure your printing system is productive for many years. Zebra Complete bundles Genuine Zebra Supplies that Zebra's experts recommend for your application with a comprehensive service contract that covers the complete printer—including the printhead—for wear, damage, and abuse. Zebra customers that opt for the program protect themselves with a comprehensive service agreement with each roll of media they purchase, and protect their printers by using quality, optimized supplies.

## How Batteries Impact Performance

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There is more to judging battery performance and value than whether or not the battery can power a printer for a full shift. The cost is clear when a battery fails: lost productivity until the battery is replaced or recharged. The costs of keeping a battery ready and running, however, are often overlooked and misunderstood. Batteries have three important limitations: the amount of printing they can power from a single charge, the capacity of original power to which they can be recharged, and the number of times they can be expended and recharged before replacement is required. Focusing solely on labels per charge may lead to decisions that may increase total cost of ownership because of a shorter-than-necessary replacement cycle.

The amount of charge a battery will hold and the number of times it can be replenished are functions of the battery itself, and the printer and charger with which it is used. All should be designed for use together to provide maximum output over time. A battery that isn't optimized for use with a printer may produce fewer labels or tickets per charge, necessitating more frequent recharges. Every time the battery needs to be charged,



workers must stop their activity, eating away at productivity. Since the average hourly labor cost of mobile workers is significantly higher than the price difference between OEM and replacement batteries, total cost of ownership can rise even if spending on replacement batteries goes down.

Frequent recharging also hastens performance degradation and shortens the battery’s lifespan. Every time a battery is expended and recharged, it loses a little of its capacity. Zebra conducted comparison tests between one of its batteries and a competitive battery used in the same printing application. The competitor slipped below 80 percent capacity after 200 discharge-recharge cycles. The Zebra battery still had more than 80 percent of original capacity after 300 cycles. The competitive battery will clearly need to be replaced more often in this situation.

Battery system intelligence helps explain some of the life cycle difference. Overcharging a battery causes it to lose its capacity more quickly. Overcharging can also overheat the battery, which causes cell damage. A well-designed, compatible battery and charger work together and lessen the degradation effect. Zebra batteries have sensors and protective circuits that optimize the charging process by monitoring voltage, temperature, and total charge time. The charging process stops automatically if any variable reaches its maximum tolerance levels. Short-term needs for power are balanced against the ideal long-term care to provide consistent performance and minimize the replacement cycle.

Mixing and matching batteries and chargers can be dangerous to the equipment as well as the budget. In extreme cases, incompatible battery-charger-printer combinations cause fire or explosions. Zebra invests heavily in engineering plus UL, CE, CSA, and other safety and regulatory testing and certification. Other manufacturers have different quality and safety standards. For these reasons, the use of non-authorized replacement batteries can invalidate Zebra mobile printer warranties. Mobile printer management would be easier if batteries and chargers were interchangeable, but they’re not. That’s why Zebra has developed numerous charger options so customers can optimize power performance for their applications. The chart below summarizes charging options for Zebra mobile printers. Contact Zebra for information about the full range of chargers.

**Fig. 1: Select charging options for Zebra mobile printers**

	<b>Fast, Wall Charger</b>	<b>Quad Charger</b>	<b>Vehicle DC Adapter</b>	<b>Plug-in, Running Charge Adapter</b>
Cameo® Series	✓	✓	✓	—
QL™/QL Plus™ Series	✓	✓	✓	✓
RW™ Series	✓	✓	✓	✓



## The Service Component

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Extended service contracts are a useful resource for reducing total cost of ownership and promoting reliable, consistent printer performance. Contracts are a way to control costs and bring predictability to repair expenses. Comprehensive contracts that cover labor, printheads, batteries, and other parts prevent surprise repair costs and inconsistent monthly services expenditures. Service contracts with the OEM also promote excellent long-term performance because printers will be serviced by certified professionals using genuine, manufacturer-approved replacement parts. Contracts also take the cost and convenience barriers away from performing preventive maintenance. Zebra, for example, offers service plans that let customers proactively replace mobile printer printheads and batteries at no extra cost before there is a problem. Zebra also has comprehensive, multi-year ZebraCare service plans that cover parts, printheads, and labor, including repairs resulting from physical damage, for less than the cost of a replacement printhead alone. Features like these can make service plans extremely cost-effective, and result in superior TCO compared to printers maintained with pay-as-you-go service.

## Accessories Shouldn't Be Afterthoughts

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Mounting units and carrying straps intended to add convenience to printing operations may inadvertently add cost. Unless accessories are designed specifically for use with the printer, they may introduce new pressure points; put stress on cables and connectors; or fail to properly protect the printer against shock, vibration, and damage. The result is more frequent repairs and cable replacements. General-purpose accessories also may not be as easy to use as ergonomically designed custom models, leading to decreased productivity and potential repetitive strain injuries.

## Conclusion

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To get superior performance, reliability, and longevity, mobile printers should be treated as an integrated system. Printheads that cost hundreds of dollars to replace can be damaged by incompatible, “bargain” media. Third-party batteries, accessories, and other components can also have unintended effects on the printer and result in unnecessary repair and replacement costs. Short-term cost savings that may be gained by using non-recommended batteries, parts, supplies, and accessories are often offset by premature failure, ensuing lost productivity, invalidated warranty coverage, and higher repair expenses.

Zebra Technologies offers a complete line of mobile printers; more than 1,000 media options; top-quality replacement batteries, printheads, parts, and accessories designed specifically for use with its printers; and several flexible service plans. Zebra carefully designs, builds, and maintains its products to provide reliable performance in mission-critical applications. More than 90 percent of Fortune 500 companies use Zebra-brand printers. Visit [www.zebra.com](http://www.zebra.com) for more information about Zebra mobile printers, supplies, parts, and service programs.





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