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A Zebra Technologies White Paper

Maximizing the Image Life of Direct Thermal Receipts and Wristbands



Direct thermal printing dates back to the 1960s and was originally designed for copiers and fax machines that utilize chemically coated paper. It has since been transformed into a highly successful print technology for bar coding.

Direct thermal media is essentially a self-contained printing system. It is manufactured by applying surface coatings to the media with a chemical formula that includes colorless dyes and developers. When the media goes through a thermal printer, heat (thermal energy) from the thermal printhead causes the dye and developer to activate and form a high-definition image. The thermal printhead consists of many heating elements distributed along its printing width. Each element is electronically controlled to deliver the correct amount of energy to an exact location for an exact amount of time. Those individual elements are strobed by the printer to form the final image—text, graphics, and bar codes. Fully saturating or imaging direct thermal chemistry is key to obtaining the most durable direct thermal image. Producing a less than fully saturated image will reduce the image life when exposed to various contaminants or environmental conditions.

Keys to Image Durability

While a fully saturated image looks similar to a less than fully saturated image, the durability of these images varies greatly. Therefore, it is important to understand that the direct thermal material being used, combined with the printer settings, determines the durability of a direct thermal image. In addition, it is also important to understand that the default setting of the printer may not always produce a fully saturated image. For that reason, any investigation of direct thermal image durability issues should include an evaluation of the printer settings, in conjunction with the material being utilized.

The key printer settings are the darkness or tone and the print speed. The darkness or tone setting determines how much the printhead is heated up. The print speed determines how fast the image prints.

Each direct thermal material has a different sensitivity level. The sensitivity level affects how much heat is needed to produce the image.

Zebra's Supplies R&D Team has performed testing on genuine Zebra™ direct thermal receipt paper and wristbands to determine the proper setting for each printer to ensure a fully saturated image with the highest durability.

Mobile Receipt Printers

Direct thermal receipt papers have archivability durations of up to 25 years (depending on the material), provided they are formed properly and the receipts are handled and stored under the proper conditions. For archival use, these receipts need to be protected from exposure to light, heat, water, solvents, cleaners, plasticizers (common sources are plastic bags and binders), and oils (including vegetable oils and skin oils), and they need to be stored with compatible materials at temperatures less than 70° F/21° C, and 35–50% relative humidity (RH). Image durability depends on the energy used to print the receipts. To maximize image durability, the receipts should be printed at or above the default energy settings.

Following are Zebra’s recommendations to ensure that the image on the receipt paper is fully saturated when using genuine Zebra supplies:

Recommended settings:

- Speed: 3
- Contrast: 0
- Tone: see below

Receipt Paper	MZ 220™	MZ 320™	QL 220 Plus™	QL 320 Plus™	QL 420 Plus™	RW 220™	RW 420™
Z-Perform™ 1000D 2.4 mil Receipt	25	25	20	20	20	10	10
Z-Perform 1000D 3.5 mil Receipt	25	25	20	20	20	0	0
Z-Select™ 3000D 2.3 mil Receipt	15	15	10	10	10	10	10
Z-Select 4000D 3.0 mil Receipt	0	0	0	0	0	0	0

Wristband Printers

To ensure a wristband image lasts the length of a patient’s stay in a hospital, or a patron’s stay at an event or park, while being subjected to the harsh environmental conditions in these applications, the printer’s settings must be modified from its default settings as recommended below.

Recommended Settings:

- Speed: 2 inches per second/50.8 mm per second
- Darkness: See below

Wristbands	HC100™ Printer	ZPL® Printers	EPL™ Printers
All Zebra Z-Band® Wristbands	Set by cartridge*	22	13

* The settings stored in the SIM card on the HC100 already contain the proper darkness and print speed settings to ensure maximum durability.

Direct thermal materials are convenient to use in that a ribbon is not required to create the image. You can’t judge the durability of a direct thermal image based on how it appears. The thermally activated coating on direct thermal media requires that the image be fully saturated to ensure image durability for critical applications. Therefore, utilizing genuine Zebra media that has been pre-tested for image durability in your Zebra® printer is key to ensuring durability in critical applications.

A global leader respected for innovation and reliability, Zebra Technologies Corporation (NASDAQ: ZBRA) provides enabling technologies that allow customers to take smarter actions. Providing greater visibility into mission-critical information about assets, people and transactions, our extensive portfolio includes bar code, receipt, card, kiosk and RFID printers and supplies, as well as real-time location solutions. For more information about Zebra's solutions, visit www.zebra.com.



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