

# Thermal printer

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Jump to: [navigation](#) , [search](#)    *For the type of printer which uses sparks and aluminised paper (and is sometimes referred to as a "thermal printer"), see [spark printer](#)*

.  
See also:

[Thermal transfer printer](#)

A **thermal printer** (or **direct thermal printer**) produces a printed image by selectively heating coated [thermochromic paper](#) , or [thermal paper](#) as it is commonly known, when the paper passes over the thermal [print head](#)

. The coating turns [black](#)

in the areas where it is heated, producing an image. Two-color direct thermal printers are capable of printing both black and an additional [color](#)

(often

[red](#)

), by applying

[heat](#)

at two different

[temperatures](#)

.  
[Thermal transfer printing](#) is a related method that uses a heat-sensitive ribbon instead of heat-sensitive paper <sup>[1]</sup> .

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## [ [edit](#) ] Essential mechanisms

A thermal printer comprises these key components:

- Thermal head — generates heat; prints on paper
- Platen — a rubber roller that feeds paper
- Spring — applies pressure to the thermal head, causing it to contact the thermo-sensitive paper
- Controller boards — for controlling the mechanism

In order to print, one inserts thermo-sensitive paper between the thermal head and the platen. The printer sends an [electrical current](#) to the [heating resistor](#) of the thermal head, which in turn generates heat in a prescribed pattern. The heat activates the thermo-sensitive coloring layer of the thermo-sensitive paper, which manifests a pattern of color change in response. Such a printing mechanism is known as a

**thermal system**

or

**direct system**

.

The paper is impregnated with a solid-state mixture of a dye and a suitable matrix; a combination of a [fluoran leuco dye](#) and an [octadecylphosphonic acid](#) is an example. When the matrix is heated above its melting point, the dye reacts with the acid, shifts to its colored form, and the changed form is then conserved in metastable state when the matrix solidifies back quickly enough. See [thermochromism](#)

.

Controller boards are embedded with firmware to manage the thermal printer mechanisms. These controller boards' features are designed to meet the needs in terms of functionalities and specifications.

The [Firmware](#) can manage multiple bar code types, graphics and logos. They enable the user to choose between different resident fonts (also including Asian fonts) and character sizes.

Controller boards can drive various sensors like paper low, paper out, door open, top of form etc., and they are available with the most commonly used interfaces (RS232, Parallel, USB, wireless). For POS application some boards can also control the [cash drawer](#) .

## [ [edit](#) ] Applications

Thermal printers print faster and more quietly than [dot matrix printers](#) . They are also more economical [\[1\]](#) since their only consumable is the paper itself. Even though the paper is more expensive, printers can be rapidly refilled, leading to almost zero downtime. Commercial applications of thermal printers include [fil](#)

[ling station](#)

pumps, information

[kiosks](#)

, [point of sale](#)

systems, and voucher printers in

[slot machines](#)

.

Through the [1990s](#) , many [fax](#) machines used thermal printing technology. Toward the beginning of the [21st century](#) , however, [thermal wax transfer](#) ,

[laser](#)

, and

[inkjet](#)

printing technology largely supplanted thermal printing technology in fax machines in order to allow plain-paper printouts.

The [Game Boy Printer](#) , [made in 1998](#) , was a small thermal printer used to print out certain elements from some [Game Boy](#) games.

Early formulations of the thermo-sensitive coating used in thermal paper were sensitive to incidental heat, [abrasion](#) , [friction](#) (which can cause heat, thus darkening the paper), light (which can fade printed images), and [water](#) . However, more modern thermal coating formulations have resulted in exceptional image stability;

*theoretically*

, thermally-printed text should remain legible at least 50 years.

Hospitals commonly record fetal [ultrasound](#) scan images on thermal paper. This can cause problems if the parents wish to preserve the image by laminating it using a traditional

[laminator](#)

, as the heat will cause the entire page to darken. It is advisable to test the laminator using thermal fax paper, or an unwanted thermal POS receipt to see if this happens. As before, an option is to make a permanent ink duplicate of the image, and laminate that, testing first to ensure that the copying process won't darken the image either.