

Battery Operated Digital Pen

In today's Era digital technology is entering classrooms and learning environments, handwriting remains primarily taught using regular pencil and paper. A battery-operated digital pen is a writing instrument that allows the user to digitally capture a handwritten note or drawing. Usually, a digital pen comes with a Universal Serial Bus (USB) cradle to let the user to identify and upload the handwritten notes to a personal computer (PC). The pen looks like a regular ball-point pen and can be used as well, but requires special digital paper if the user wishes to digitally capture what he has written. A page of digital paper, which can be purchased in traditional pad or sticky-note size, has small dots on it that allow the pen to "see" what has been written. Digital pens look like fatter versions of ordinary pens, packed with electronic circuits, optical devices, and Bluetooth, they can record the things you write and transmit them automatically to your computer using wireless technology. Sounds amazing doesn't it, so how exactly does it all work?

Working of Digital Pen

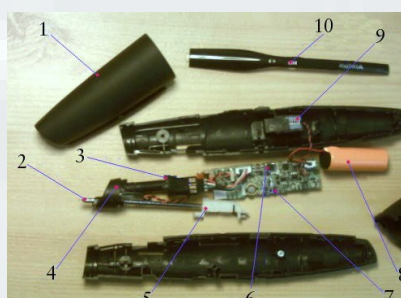
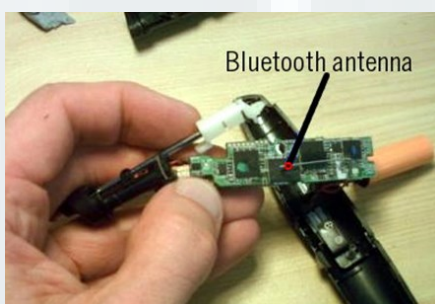
When the user complete writing on his digital paper, he puts a checkmark in the "save" box. The pen vibrates or beeps to confirm that it knows the box has been checked and that the user is done with that page and wishes to save it. Usually, a digital pen can store up to 40 pages of saved digital paper in its memory. Only the checked pages are saved. Most pens save the handwritten data as an image file (GIF or JPEG, depending on the pen's manufacturer) although some digital pens use a proprietary file format. When the user wants to upload his saved notes from the pen, he docks the pen in its USB cradle. The File is then transferred and saved to a specified folder once cradle automatically senses the pen's presence.

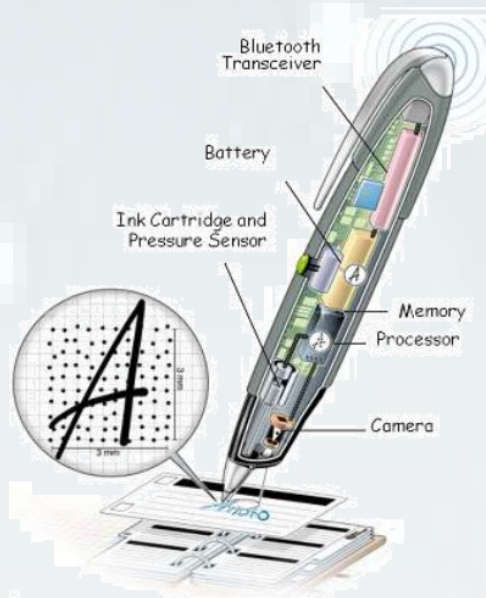
Many digital pens come with handwriting recognition software that allows the user to import their handwritten notes into typed text format. Some of the newer high-end digital pens are wireless, taking advantage of Bluetooth technology. These pens do not require a docking station, but instead send the captured notes or drawings directly to the user's PC or cell phone.

Move the digital pen across the special paper and this is what happens:

1. The **ink refill** leaves an ink trail on the page. We can see this but the pen can't.
2. The **infrared LED** in the base of the pen shines onto the page. We can't see it because our eyes can't detect infrared.
3. The **light detector**, also in the base of the pen, picks up the infrared reflected off recognition marks printed on the special paper.
4. The **microchip** in the pen uses the pattern of reflections to store images of the words we are writing.
5. The **Bluetooth antenna** built into the pen transmits the stored data wirelessly and invisibly through the air.
6. The **wireless receiver** in our computer picks up the Bluetooth signals and stores what we have written. Software in the PC converts this data into normal, editable text that can be import into a word-processing program.

What's inside a digital pen?

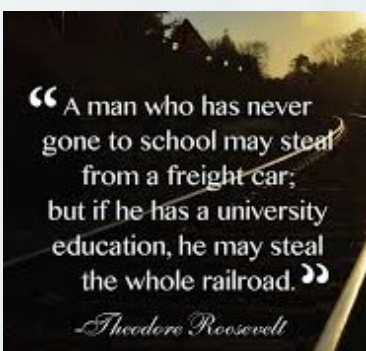




Internal part of Nokia digital pen is how we find:

1. **Pen cap:** Nothing hi tech about this. It just keeps the ink off your clothes and protects the light detector.
2. **Ordinary ink refill:** Leaves a trail on the paper so you know what you've written.
3. **Docking connector:** When the pen sits in its docking cradle (not shown), this connector charges the battery and downloads your words, via the docking station, to your computer.
4. **Pen optics:** This compartment holds the most important parts of the pen: the LED light that shines onto the paper and the photocell that detects the reflected light. Unlike an optical mouse, a digital pen uses invisible infrared, so you can't actually see the light it uses.
5. **Refill holder:** It's as low-tech as it sounds: it's a simple piece of plastic that holds the ink refill in place.
6. **Indicator lights:** These shine up through the pen case to tell you when the pen needs recharging, when it's full of words, and so on.
7. **Reset button:** You can push a tiny little rubber button on the base of the pen case to reset it.
8. **Rechargeable battery:** This should last a few years at least.
9. **Vibrating motor:** Have you ever wondered how cellphones (mobile phones), pagers, and other mobile devices give you one of those vibrating alerts? Here's the answer. It's a tiny electric motor with a wonky bit of metal on the end. As the motor spins, the wonky metal wobbles around on the end making the whole thing shake like a badly loaded washing machine.

Indicator lights on pen top: The lights on the circuit board shine up through transparent areas on the plastic pen case.



Prof. Meena Perla
Assistant Professor