eInstruction® Interwrite Mobi Pen II

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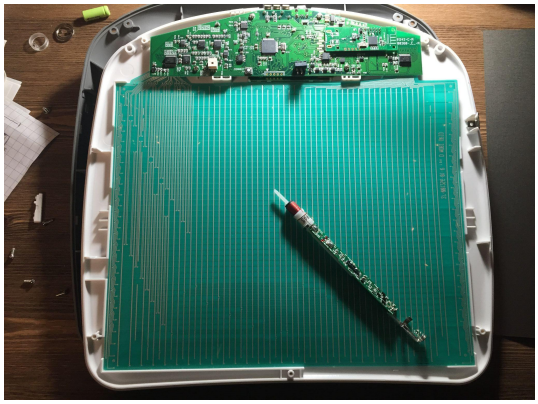
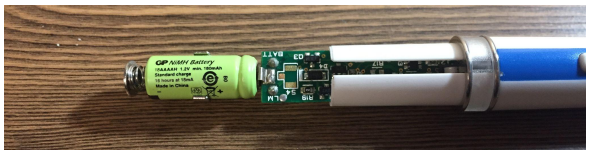
The Interwrite Mobi was a series of educational drawing tablets released by eInstruction in 2008, prior to its acquisition by Turning. It was in common use until 2015. The product contains a stylus, a drawing tablet, a USB Bluetooth receiver, and a small drawing program for whiteboard use.

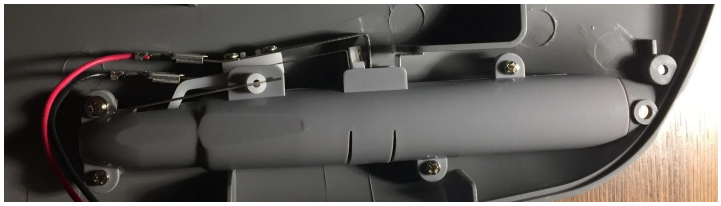
It is important to understand the basic mechanics of our drawing tablet. Inside is a grid of perpendicular traces on a thin PCB (shown right). These function as antennae, able to receive small electromagnetic pulses. The stylus contains a copper coil which induces a current in the wires. The tablet's circuitry can determine the pen's position based on where the signal is strongest, and also decode transmissions for button presses, battery life, and other data.



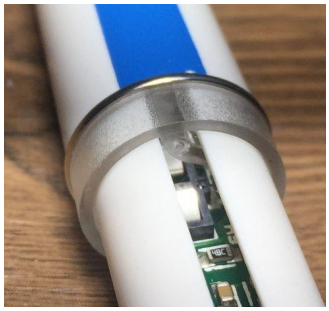
The pen's case is in two main halves. One is meant to be removed in order to replace the 1.2 volt NiMH battery. The battery holder saves space by pressing the battery directly into a contact on the PCB, shown below.



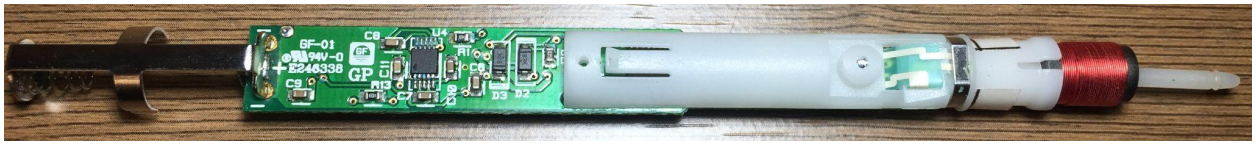
The pen charges using the two metal rings, which make contact between the Mobi and two springs on the stylus PCB. They are separated by translucent plastic which doubles as a light pipe for the power LED.

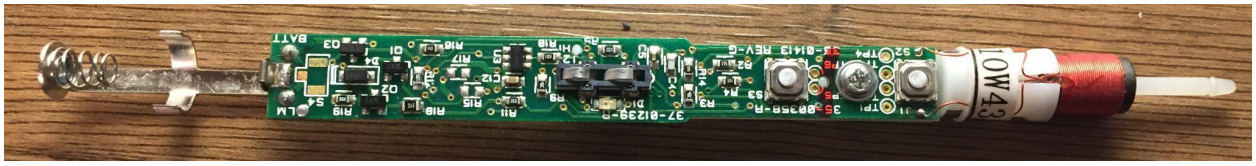


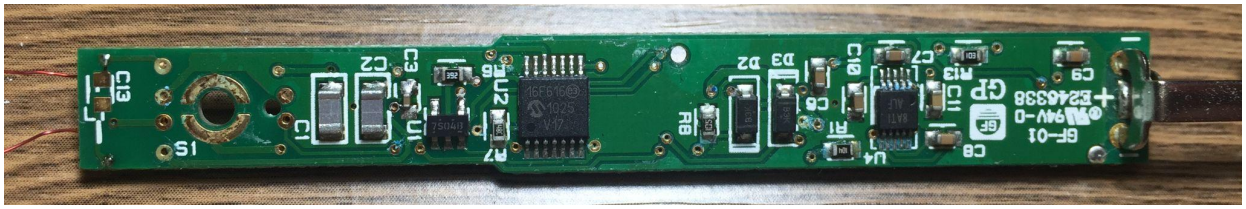
(Above: Interwrite Pen II dock contacts. Below: Metal rings and light pipe)



Further disassembly allows the PCB to slide out.

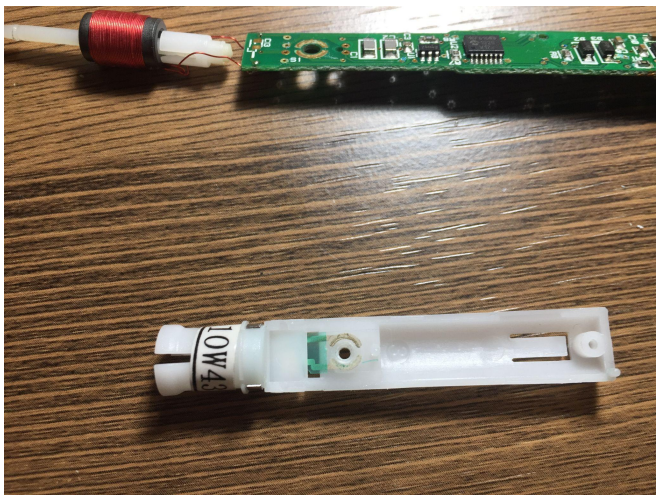




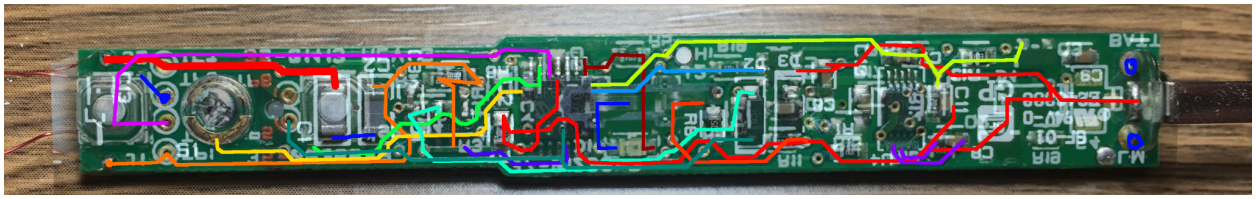


After the battery holder, there is a block of charging circuitry with an unidentified chip labeled U4. It is likely a charge control chip, which detects changes in the cell's voltage and halts charging accordingly. There are also several SMD transistors and diodes to stop the battery from over-discharging and to clamp the voltage to an acceptable level. We can clearly see the two ring

contacts in the middle of the board, as well as the adjacent power LED. There is a white plastic part which houses the electromagnet and the pen tip. Its flat flex cable running to the contacts around the screw is in two halves, and actually functions as the button for the stylus tip. Hidden under it there's a Microchip PIC16F616 running the device. This is a 2-5 volt microcontroller with 11 I/O pins and 2 analog comparators.



Overlaying the images of the board's two sides, we can determine how it's being used:



Pin	Connection	Pin	Connection
1	+2V from power supply (VDD)	2-4	Battery voltage detection (Analog)
5	Lower button (Digital)	6	Upper button (Digital)
7	0V reference for comparator	12	U1 to coil signal

It's been interesting to see how such a compact device operates. There are some fascinating space-saving solutions implemented like the battery holder and the tip button, and it's a nice demonstration of common systems in portable devices. This was also my first time mapping out a PCB by drawing over it and it has proved extremely helpful in understanding the details of how a device is laid out.

Appendix A: Electrical parts list

Part	**Function / Description**
NiMH Battery (BATT)	1.2 volts, rechargeable
8ATI (U4)	Battery charge controller
D2-D4	Battery over-discharge protection
Q1-Q3	Battery management and power switching
U3	Op-Amp for measuring battery voltage
PIC16f616 (U2)	Microcontroller
7S04B (U1)	Coil amplifier/switcher
D1	Power LED
L1	Coil
S2-S3	Press switches
S1	Pen tip contacts
L2	Pen casing charging connectors

Appendix B: Works Cited

Microchip. (2009, March 26). PIC16F610/16HV610 PIC16F616/16HV616 Data Sheet. Chandler, AZ; Microchip.

eInstruction. (2009). *Getting Started: eInstruction Interwrite Mobi for Windows and the Mac*. Denton, TX.

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