Disassembly of Palm IIIx: Predecessor of Smartphones/PDAs

## Summary Report

What Product was Chosen and Why:

As a first-time participant in this challenge, my goal was to find a device that made an impact in today's technology. My parents were techies in their younger days so I knew that I would find something interesting in their drawers, and I did. I found something that looked like a smartphone. I asked my dad, and it was his Palm IIIx - a personal digital assistant (PDA) device way back in the late 1990's. I got more interested when I found out that the device is older than me and still works.


Photo of My Dad's Actual Palm IIIx (Powered On) and Stylus
(Before Disassembly)

I researched on Palm IIIx and found out that it was released on 1999 by Palm Computing. Before smartphones and iPADs, Palm PDAs were the popular handheld devices that were like mobile personal computers but with no internet connectivity. It paved the way for the development of today's popular smartphones and handheld devices. I decided that it would be great to learn more about this legacy product.

I was also surprised to find one TI component inside the device, the analog-to-digital converter BB ADS7843E 9299.

Components Found:
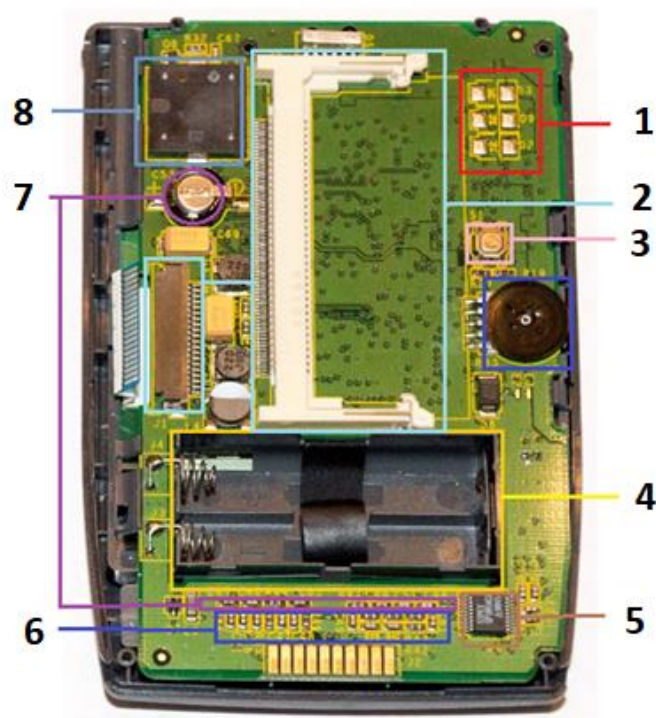
Motherboard Front/Top View

No.	Component	Description/Function
1	Diodes	Control direction of current flow.
2	Connectors (hard and flexible)	Connect components on a PCB.
3	Switch(es)	Control the flow of electron in a circuit.
4	Battery chamber	Houses the device batteries.
5	SIPEX SP385ACA 9845 (Integrated circuit)	CMOS that converts transmission data to RS232 serial communication data transmission standard.
6	Resistors	Limit current and divide voltage.
7	Capacitors (round and rectangular)	Block direct current (DC) while allowing alternating current (AC) to pass.
8	Loud speaker or buzzer	Makes buzzing noise or tone when voltage is applied.
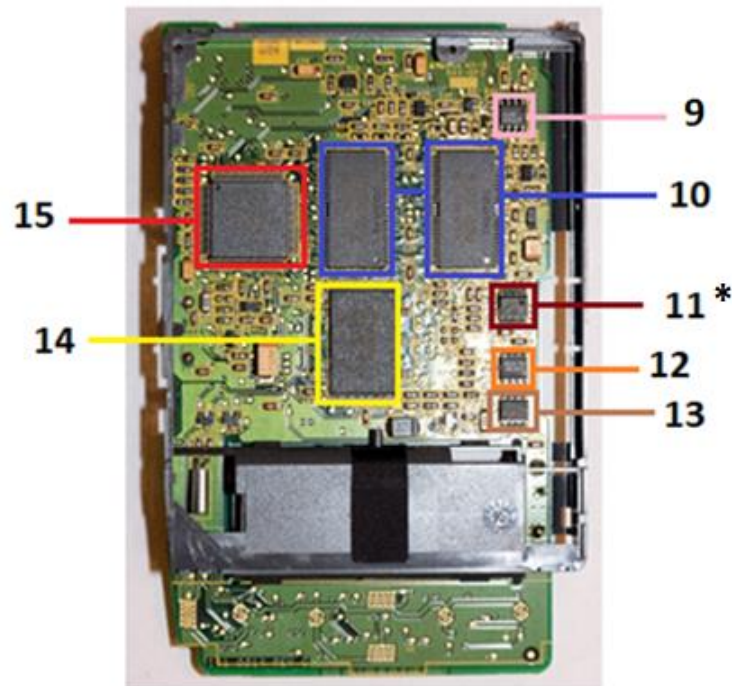
Motherboard Back/Bottom View (with Major Microchips)

No.	Component	Description/Function
9	LT922 1084	Switch power regulator. Transfers and controls input voltage, bit by bit, to the output.
10	SEC Korea 934 KM416V1204CT-L6	Random Access Memory (RAM). Both chips provide 4-MB total memory and stores each bit of data in a separate tiny capacitor within an integrated circuit.
11 *	**BB ADS7843E 9929 ***	Analog-to-Digital Converter/Touch-Screen Controller. Converts analog data input to digital signal for processing.
12	9299 NZ ML4851	Low-current, voltage boost regulator. Designed for DC to DC conversion in one- to three-cell battery powered systems.
13	S1PEX 4422ACN 9926	High-voltage generator for backlight.
14	Malaysia 29LV160B-90PFTN 9920 F74	Flash Memory. Retains data even if when power is shut off. Memory can be erased and reprogrammed electrically.
15	DragonBall XC68238PU16V 1J83G HHDM9909	CPU. Handles all instructions received from hardware and software running on the device.

* TI component
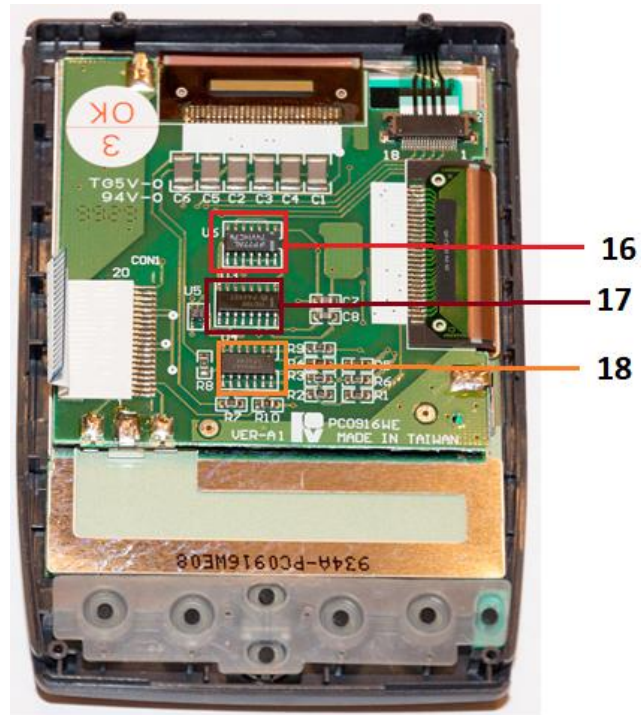
LCD Panel Board

No.	Component	Description/Function
16	P77AL 74VHC74	Advanced high-speed CMOS dual D-type flip-flop for resetting data.
17	140188 PAX927	*No info available.*
18	HM94AZ LP324M	Micropower quad operational amplifier for controlling voltage output.

Conclusion:

From this experience, I learned how to read components on a PCB and how each works. Each component has a designated letter (ex: R for resistor), and differs in looks depending on size and capacity (ex: capacitors come in round and rectangular sizes).

I also learned that A/D converters are important so we can process real-world data, which is in analog. The ADS7843 series A/D converters are still used in today's touch-screen devices.

I am ecstatic that the device still works after the disassembly and reassembly because I know that it somehow has sentimental value to my dad. I am very grateful that he allowed me to take it apart so I could learn from it.

Palm IIIx Still Working After Reassembly

Total word count excluding document headers, document title, footnote, captions, components/parts name list (but not description), and table/column headings: 488

Disassembly

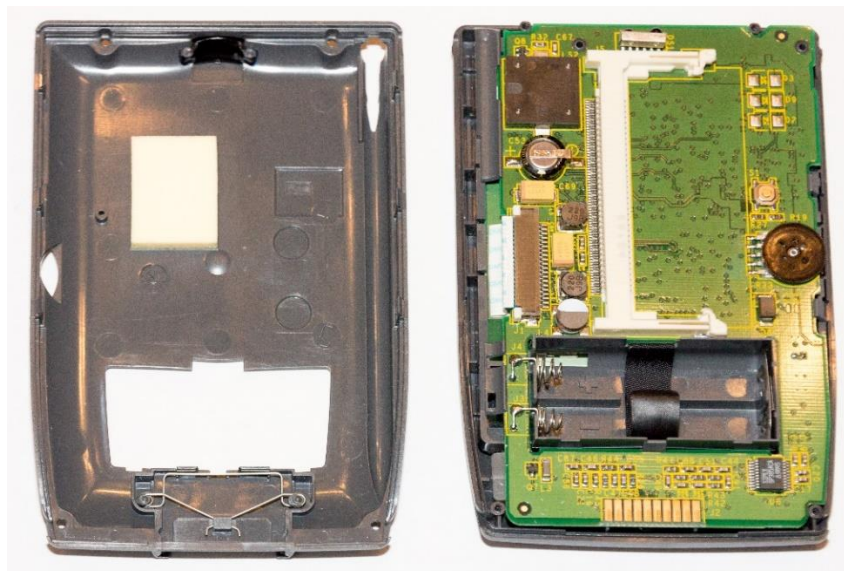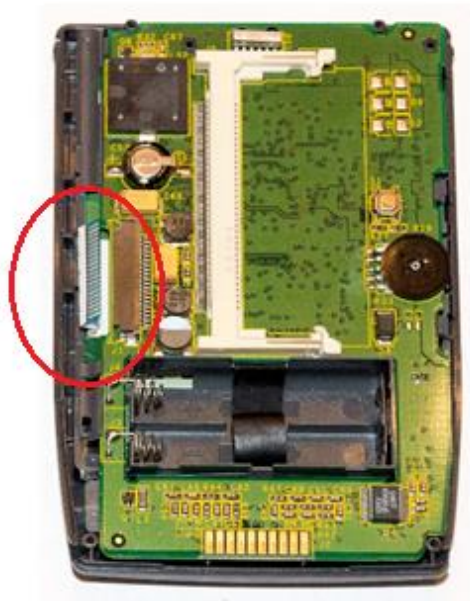*Figure 1: Removal of the battery cover and the four screws from the back cover of the device*

Figure 2: Separation of the back cover from the device to access to motherboard
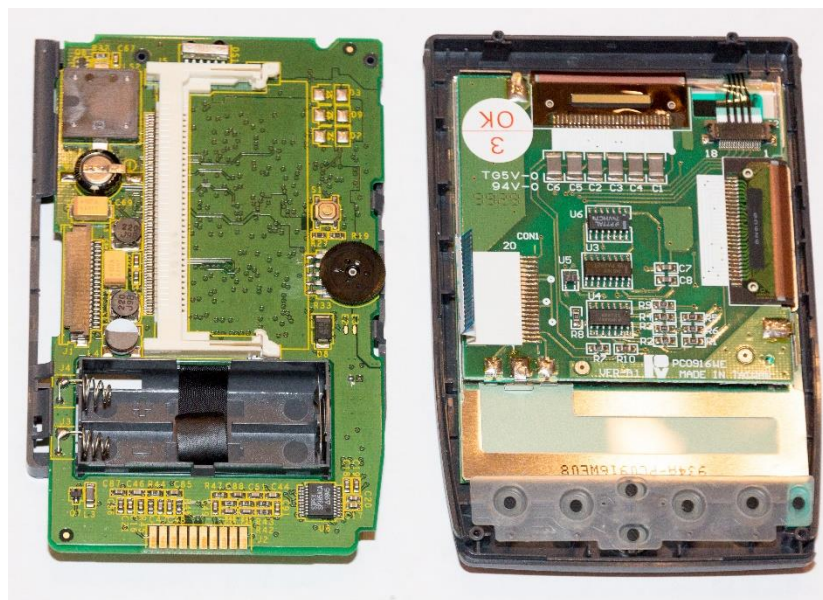
Electronics Online Challenge Sponsored by TI (cont.)

Motherboard Top View   *Motherboard Bottom View*

Figure 3: Removal of flexible circuit connector (see encircled part) to release the motherboard

Motherboard   *LCD Panel Board*

Figure 4: Separation of motherboard from device to access the LCD panel board

References

Retro? Palm IIIxe PDA unboxing and teardown - YouTube:
https://www.youtube.com/watch?v=Wg2hYwYOPYk

Palm IIIx: https://en.wikipedia.org/wiki/Palm_IIIx

Reference Designator (PCB component labels):
https://en.wikipedia.org/wiki/Reference_designator

Electronic Component Guide – The Most Common Components:
https://www.build-electronic-circuits.com/electronic-component-guide/

Palm IIIx Internals (or what 3Com don't tell you) by Jesús Arias:
https://www.ele.uva.es/~jesus/iiix/iiix.pdf

Electronics Tutorial: http://www.electronics-tutorials.ws/

ADS7843S: http://www.ti.com/lit/ds/symlink/ads7843.pdf

Analog to Digital Converter:
http://courses.me.berkeley.edu/ME102B/Past_Proj/f03/Proj6/TMS320LF2407A_Documents/Intro-ADC.pdf