Live eMate repair at WWNC

Frank Gründel

http://www.pda-soft.de

A word about me

- Frank Gründel alias Frank Gruendel
- Approx. 45 years old
- Married to an amazing wife
- One child
- Hardware developer for 15 years
- Software developer (java, C, C++, NewtonScript) since 1996

Downloads

• This presentation (PowerPoint): http://www.pda-soft.de/LiveeMateRepair.ppt • This presentation (zipped web page): http://www.pda-soft.de/LiveeMateRepair.zip • eMate disassembly instructions: http://www.pda-soft.de/emate_disassemble.html Hinge repair instructions: http://www.inventors-emporium.co.uk/pages/newtonemate-hinge.html

A word about me

- I started Newton hardware rebuilds and repairs in 2000 when someone needed a Newton 2000 battery rebuilt
- The rebuild instructions were the first page of <u>http://www.pda-soft.de</u>
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- An increasing number of people seem to think that I know a lot about Newton hardware...
- ... which is the reason I am here today!

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…so please be gentle!

A word on tools

Do not use cheap or dull, old tools
Magnetize all tools, especially screwdrivers
Screws like to hide in carpets...

You will need:

A medium size flat-blade screwdriver
A pair of tweezers
A pointed plastic letter opener or similar tool
A soldering station (not absolutely necessary)

You will also need:

A Phillips size 0 screwdriver
Torx 8 and Torx 10 screwdrivers



The problem

 The display ribbon cable is punctured by a hinge spring

This is a severe design flaw of the eMate
 It will affect EVERY eMate unless caught in time

The defect

- Horizontal lines are missing on parts of the screen
- Often there is no response to pen taps
- The screen opens much more easily than before



How to start

 Slide the contrast and volume sliders a couple of times to get a feel for them. You will be testing them for proper engagement after the mainboard has been put back in

If the hinges are not fixed yet, always remove the main logic board first

 If the hinges are fixed and you only want to remove the display, watch out for the pushbutton plunger!

Keyboard removal

- Not required for hinge or cable repair
- No need to disassemble anything first
- Using a flat-blade screwdriver, pry up the keyboard in three places (below the right-hand side of the space bar and (on both sides) below the Option and Enter keys)

 When putting the keyboard back in, do not press on the keys

Starting the disassembly

If there is a card installed, remove it
If the AC adapter is plugged in, unplug it
Label all screws and other parts
Make sure the small parts are kept in order (egg carton, sticky tape, ...)

Disassembly Step 1: Battery

 Remove the battery access door (Torx 8)
 Note the orientation of the connector (red to the back)

Take the battery out





Disassembly Step 2: Case

 Using a toothpick or pointed plastic tool, pry out 4 round and 1 oval rubber screw plugs

 Remove 5 screws (Torx 10)





Disassembly Step 3: Case

- Ground yourself out on something to discharge any static electricity (metal bedpost, metal door, ...)
- Split the base, starting at the handle
- Unlock 4 catches (flat-blade screwdriver) and remove the bottom part of the case
- Remove the infrared lens and the green rubber part in the handle

Disassembly Step 4: Mainboard

 Unsolder the speaker and backlight wires (not absolutely necessary, but recommended). Note how they are routed in their notches and how the backlight wires are routed between the notch and the solder joints

 Unlock the screen cable connector by pushing the black locking tabs towards the cable

Pull the screen cable out

Disassembly Step 5: Mainboard

 Remove the 5 screws that are marked by a white bell symbol (Phillips size 0)

 Gently push the port cover assembly outwards and lift up the mainboard



Disassembly Step 6: Mainboard

 Push the card release button in, slide the mainboard to the right and fold it down onto the keyboard area. Pick it up by its edges and do not touch the delicate components



Disassembly Step 7: Mainboard

 Remove the pushbutton plunger and the charge LED lens





Disassembly Step 8: Mainboard

 If you decided to leave the wires soldered, unscrew the speaker case

 Unlock the keyboard cables and put the mainboard in an antistatic bag (or wrap it in aluminum foil). If you decided to leave the wires soldered, this will not be possible until the backlight wire connector in the screen case is disconnected

Disassembly Step 9: Mainboard

Remove the port cover assembly (Phillips size 0)
Remove the card slot bezel (Phillips size 0)

Surprise...

How are the springs?





Disassembly Step 10: Screen

- Open the eMate so that the lid lies completely flat
- Remove the 4 rubber screw plugs (pointed plastic tool, pointing away from the screen)
- Using the Torx 8 screwdriver again, remove the 4 screws





Disassembly Step 11: Screen

 The bezel is held by 12 catches

 Unlock the 4 catches at the bottom (flatblade screwdriver)





Disassembly Step 12: Screen

- Unlock the remaining catches, working towards the top
- Remove the bezel
- Don't close the lid with the bezel removed or you'll damage the lid's position detection pushbutton switch



Disassembly Step 13: Screen

- Remove the 2 screws at the top of the display and the bottom screw of the righthand hinge (Phillips size 0)
- Disconnect the backlight connector
- Put something like a soft cloth on the keyboard





Disassembly Step 14: Screen

- Lift the display assembly off its posts and put it facedown on the keyboard
- Unlock the connector by pushing the black locking tabs towards the cable
- Pull the cable out and put the display unit away. Only touch it at its edges





Disassembly Step 15: Hinges

Remove the top screw of the left-hand hinge (Phillips size 0) and take out the shielding clip

 Remove the remaining two hinge screws (Phillips size 0)



Disassembly Step 16: Hinges

 Provided the pushbutton plunger has been removed, tilt the lid upright and push it away from you

Note how the screen cable and the backlight wires pass around their left and right hinge posts. Better yet, make sketches



Disassembly Step 17: Hinges

 Flip the case over and loosen the black screws of both hinges (Phillips size 0). Do not remove them

 Remove the remaining 4 hinge screws (Phillips size 0) and remove the hinges

Remove the ribbon cable





Fix the hinges

- Hinge fix demonstration is tedious, boring and beyond the scope of this presentation
- Of the 99 ways to put a hinge back together, only one is correct...
- If you are not willing to risk taking the hinges apart, the minimum preventative maintenance that should be done at this point is to apply some oil or grease to the springs

Fix the cable

 Fixing the ribbon cable is possible, but requires the skill and the equipment to solder under a microscope (I can do this for you)

 New cables are available (a review can be found in the hardware section of <u>http://www.pda-soft.de</u>)

Reassembly Step 1: Hinges

- Be aware that left and right hinges are not alike (they are marked "L" and "R")
- Since the eMate is currently upside down, the hinge marked "L" will actually be on the right side...

 All hinge screws have blue thread lock material on them. Be aware that there are identical screws without it. Do not accidentally use these screws for the hinges

Reassembly Step 2: Hinges

 Thread the ribbon cable through the slit from the keyboard side and put the left hinge (marked "R") back in. Make sure the cable passes correctly around the hinge axis and is correctly routed around the screw post on the other side

Put the right hinge (marked "L") back in. Fasten the hinges with two screws each (Phillips size 0)

Reassembly Step 3: Hinges

- Remove the black middle screws of both hinges and put wave washers beneath them
- Reinsert and tighten the screws
- This is by far the most important step of all, so...
 DO NOT FORGET IT !!!





Reassembly Step 4: Hinges

- Flip the eMate around and adjust the hinges in a way that the ends point upwards
- Clip the screen case bottom over the axes
- Reinsert and tighten the bottom screw of the left-hand hinge and the top screw of the righthand hinge (Phillips size 0, no built-in washer) and clip the shielding clip back onto the left hinge

Reassembly Step 5: Hinges

 The backlight wires must pass behind the cylindrical hinge post. If you decided to leave the wires soldered, this won't be possible until the mainboard is back in place

 Again, make sure that the ribbon cable curls correctly around the hinge post and is not pinched





Reassembly Step 6: Hinges

Put the shielding foil end over the shielding clip

 Reinsert and tighten the top screw of the lefthand hinge. Use a screw with a "built-in washer" and blue thread lock on it

Ground yourself out

Reassembly Step 7: Screen

- Put something soft on the keyboard and put the display unit upside-down on it. Touch the display only at its edges
- Insert the screen cable into the connector
- Do not forget to lock the connector





Reassembly Step 8: Screen

- Flip the display unit over and push it onto its 4 posts
 Do NOT press on the
 - screen, only press where the posts are



Reassembly Step 9: Screen

- Fasten the cable by inserting and tightening the bottom screw of the right-hand hinge (Phillips size 0). Use the last screw with thread lock on it
- Put the two screws back in at the top of the display (Phillips size 0)
- Reconnect the backlight connector. If you decided to leave the wires soldered, this won't be possible until the mainboard is back in place

Reassembly Step 10: Screen

- Tilt the bezel upwards at the edge facing you and push it in the top four catches
- Work your way down, engaging two catches on each side and four at the bottom
- If you are confident you have done everything correctly so far, put the 4 bezel screws (Torx 8) and their rubber screen caps back in. Use the caps with the larger diameter

Reassembly Step 11: Mainboard

Close the lid

 Reattach the card slot and the port door assemblies back in (Phillips size 0)

Make sure to screw counterclockwise first until you hear a click, then tighten the screws, otherwise they will cut a new thread into their post, each time enlarging the hole and weakening the screw's grip

Reassembly Step 12: Mainboard

 If you decided to leave the wires soldered, screw the speaker case back on and thread the backlight wires past the right-hand hinge while holding the mainboard upright at the right-hand side of the eMate

You may need to use all four hands to complete this step

Reassembly Step 13: Mainboard

- Ground yourself out once again
- Put the main logic board upside-down onto the keyboard area. Avoid touching its delicate components



Reassembly Step 14: Mainboard

 Plug the keyboard ribbon cables into their connectors, and slide the connector tabs closed

 Slide the contrast and volume sliders (mainboard) and buttons (case) all the way to the left



Reassembly Step 15: Mainboard

 Check that the display cable is lodged against its guides and not twisted. Avoid trapping the end of the cable under the mainboard as you install it

 Put the lid switch button and the charge LED lens back in





Reassembly Step 16: Mainboard

- Align the mainboard so that it is tilted upwards at the right-hand side
- Slide it to the left, threading the card release button in first

Gently bend the port door assembly outwards and push the mainboard down at the right-hand edge, making sure the backlight and speaker wires are routed correctly through their notches

Reassembly Step 17: Mainboard

 Make sure the backlight and speaker wires aren't pinched between the case and the mainboard and that they are long enough to be soldered back on



 Check the board is seated flat and screw the five mainboard screws back in using the bell icons as a reference

Reassembly Step 18: Mainboard

- The bottom left-hand screw will make you think that the mainboard is misaligned, but it isn't. This is a minor flaw in the eMate design
- Open the lid slightly and test the contrast and volume sliders. They should move with a slight resistance

 Insert and eject a PC card to ensure that the mechanism is OK. Similarly, slide the port door in both directions to test its freedom of movement

Reassembly Step 19: Mainboard

 If the backlight and speaker wires were unsoldered, resolder them. The black wires are soldered to the left-hand solder pad, and the red wires to the right-hand pad

 Make sure the wires are correctly routed through their notches





Reassembly Step 20: Mainboard

Push the display cable into its connector and lock the connector
Slide the keyboard ribbon cables back under the 2 cm, plastic, horizontal retention bar as shown

Flip the eMate around



Reassembly Step 21: Quick Test

- Slide the contrast and the volume sliders to the center position
- Say something nice to your favorite deity
- Plug the AC adapter in. The eMate should now power up

 Check that pen input is recognized and that backlight, contrast slider and volume slider work. Close the lid slowly, the eMate should shut off when the lid is almost closed. If it doesn't, the pushbutton plunger is probably missing.

Reassembly Step 22: Case

 Power the eMate off, close the lid, remove the AC adapter and flip the eMate over

 Put the green rubber handle part back in with the notch pointing upwards

Put the infrared lens back in



Reassembly Step 23: Case

- Hold the bottom part of the case so that the edge facing you points down and slide it towards you into the bottom two catches
- Engage one catch on each side. These are often a bit stubborn and need additional persuasion

Screw the bottom 5 screws in (Torx 10), again turning them counterclockwise first until you hear a click. Do not accidentally use a battery cover screw, these are extremely difficult to remove if misused as case screws

Reassembly Step 24: Case

- Plug in the battery pack in so that the red wire is toward the back
- Fasten the battery cover with the remaining two screws, again using the Torx 8 screwdriver
- If you have any parts left at this point, you have a problem...

That's it...



That's it...

Thanks for your patience!



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