PSION

revo™

Service Manual

1999

Confidentiality & Service Support

Revo Service Manual

The Revo Service Manual will not be made available as bound and printed copy. It will be made available exclusively as an Adobe Acrobat PDF file. This manual is available as a viewable, printable and downloadable file from the Psion Computers closed World-wide Web site.

All information published on the Psion Computers closed World-wide Web site must be treated as confidential, unless it is explicitly marked as 'public domain'. Do not give your password, your user name, or even the address of the web site to anyone without written permission from Psion Computers PLC.

Revo Service Engineering Information Updates

Engineering Updates will be issued when necessary. All future Updates will be distributed through the closed World-wide Web site.

Introduction

The Revo is a handheld computer which enables the functionality of desktop applications in a handheld form. It combines innovative design and new technology, incorporating a pen for navigation, a pen stable design and a patented keyboard. The 32 bit Revo features a windows-style interface and PsiWin V2.x (Windows 95/98/Nt4.0) connectivity software to provide total integration and compatibility with office and home computer systems.
The Revo uses a powerful 32 bit open operating system named EPOC, developed by Symbian, and the ARM7TDI core processor, providing a high level of processing power while preserving battery life. EPOC is optimised for low-power, portable machines and is equally at home in a smart-phone, mobile network computer or handheld computer.
Revo is the first Psion Computers product to feature a rechargeable battery, which is sealed inside the unit and inacessible to the user. Revo also features a docking station.

The purpose of this service manual is to give an overview of the service procedures that may need to be performed on the Revo by an approved service centre. It has been designed to be used by the service and repair technicians who have the responsibility of maintaining the products.

The Revo uses both conventional component and high-density surface mount component technology which requires specialist servicing techniques and prohibitively expensive test and verification equipment. ***We therefore recommend that repairs are carried out at a circuit board level, rather than at component level***. We also encourage service centres to carry a stock of spare parts to allow immediate servicing of Revo components should they need to be replaced.

Final test Equipment

A final test routine has been designed for Revo, consisting of an IR port, a Revo docking port and custom connectors, the final test routine utilises software that is built into Revo and can be used for diagnostic purposes.
The Revo main PCB contains an EEPROM, known as E2 or the ‘e squared’ chip, this device is used to store certain configuration settings for the device’s hardware. Some of these options are hard coded during the manufacturing circuit and function testing, these settings cannot be changed and include the electronically stored version of the serial number. The remaining settings are coded by a factory final test unit, or in service by a combination of a PC based configuration application and built in self configuring tests.
As the FTU settings include language and keyboard indexes, replacement PCBs are shipped in a generic form, this means that a replacement PCB MUST be configured correctly.
Failure to correctly configure a Revo with a new PCB can result in:-
· Digitiser drift.
· Incorrect keyboard driver selection.
· Language selection failure.
· Erratic electrical activity.
Therefore it is essential to understand the use of the Revo test and configuration routine in order to perform effective repairs.
- *See **Revo Final Test manual** for more information.*

Approvals

CE Logo - This shows the product complies with the requirements for shipping to any country within the European Union and indicates that the Revo complies with both the EMC and Low Voltage Directives. The EMC Directive ensures that the product complies with the emissions requirements of EN55022 Class B, and the Immunity requirements of EN50082-1. The latter document covers static testing to +8kV, radiated RF testing and surviving 1kV Electrical Fast Transients into the mains adapter inputs. The Low Voltage Directive ensures the product complies with the requirements of the European safety standard for Information Technology Equipment - EN60950.

The C-tick logo is a requirement for products shipped to Australia and NZ. The logo shows that the product complies with the emissions standard for Information Technology Equipment, i.e. AS/NZS 3548

FCC Logo - This shows that the product complies with the requirements for shipping products to the USA. The product has been tested to show compliance with USA Federal Communications Commission requirements as detailed in US Government handbook CFR Part 15. This document covers the requirements for digital devices designed for use in residential and commercial environments (known as Class B devices). A further requirement of the US regs is to display the model number (e.g. 16MB) and the words 'Tested to Comply with FCC Standards for Home or Office Use'. The Canadian Requirements are covered by displaying the wording 'This Class B Device complies with Canadian ICE regulations. Tested to comply with FCC standards for home or office use." (The French translation "Cet appareil CL B se conforme au reglement sur le materiel brouilleur du Canada"). They show the product complies with the Industry Canada requirements specified in the Canadian Interference Causing Equipment (ICE) regs. These are currently met by testing the product to ICE-003 (currently identical to USA CFR 15 Class B).

EPOC is the built-in, highly optimized, C++, multi-tasking, 32-bit operating system of the Revo, which includes a fully featured suite of Personal Information Management, productivity and communications applications. The platform is entirely modular and supports embedded graphics and voice as well as pen and keyboard input. The real-time performance of EPOC allows it to run telephony protocol stacks and makes it suitable for communications enabled devices.

The ARM7TDI is a high-integration, application specific microcontroller which meets the needs of next generation electronic organizers and PDA's providing the combination of features and performance to cope with the increasing software demands of friendlier user interfaces, increased functionality and advanced communication protocols. The ARM7TDI is the microcontroller component of the unique hardware and software open architecture employed by the Revo.

Service Precautions

A Revo can be disassembled quickly into specific sub-assemblies allowing the accurate replacement of faulty components. The Revo promotes simple servicing procedures and it can be dismantled quickly using only a small number of tools.
Servicing is carried out at modular level and not at component level, and as such this disassembly procedure explains servicing in line with the spares modules detailed in this manual.
The Revo hand-held computer contains CMOS devices that may be damaged by electrostatic discharge (ESD). The following steps to minimise ESD must be taken before the unit is dismantled. To prevent any damage that could result if the unit or its parts are not handled properly, observe the following precautions during any handling procedures:

- Minimise all handling of static-sensitive components and assemblies.
- Transport and store static-sensitive components and assemblies in their original containers or in anti-static bags.
- Label accordingly any package that contains static-sensitive components or assemblies.
- Discharge static electricity from the body by wearing a grounded antistatic wrist strap while handling these components.

Servicing static-sensitive components or assemblies should be done only at a static-free work station by qualified service technicians. Increasing the humidity in the work area minimises static electricity problems.

- Do not allow anything that can generate or hold a static charge on the work station surface.
- Pick up components by their bodies, never by their leads.
- Do not slide components over any surface.
- Avoid handling components in areas with a floor or work-surface covering that can generate static charge.

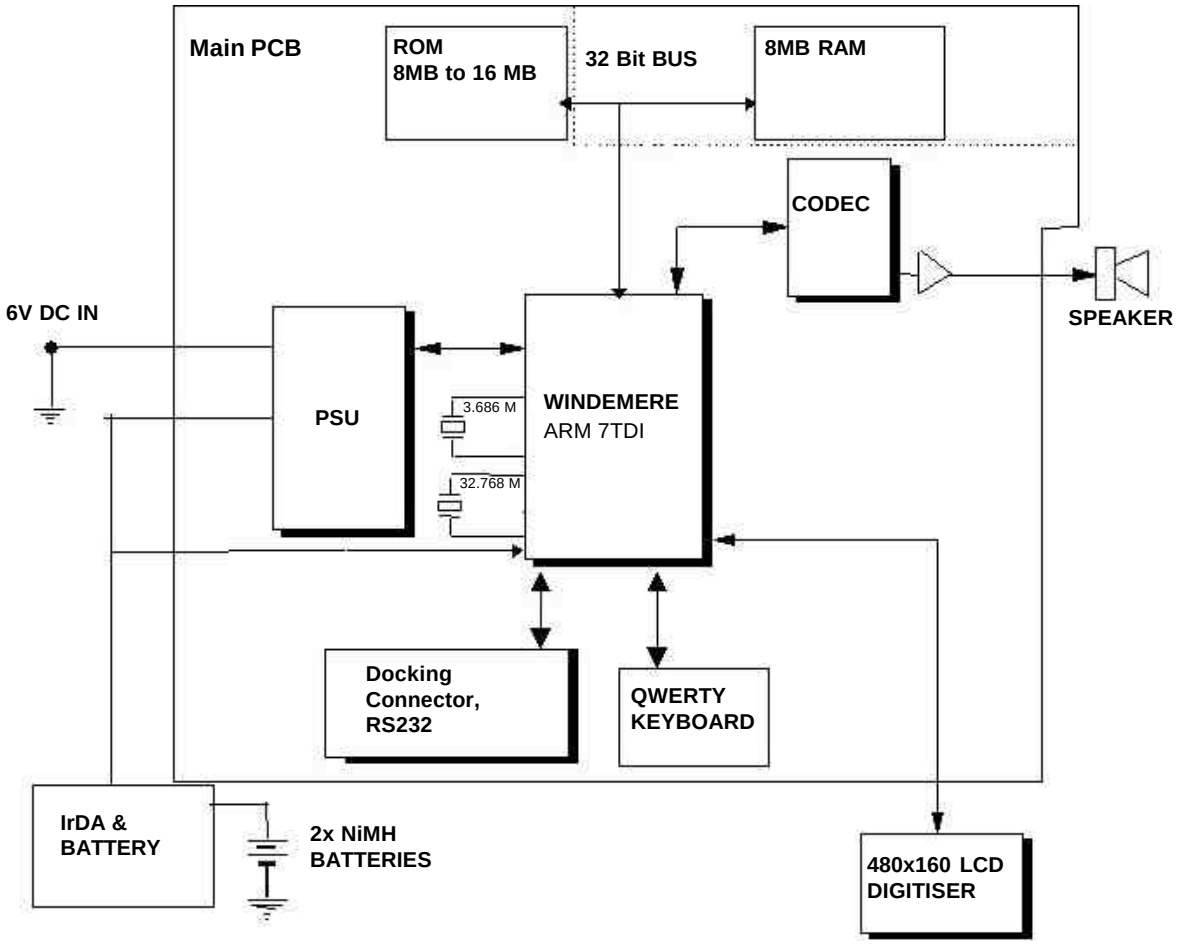
When removing the internal workings from the case, care should be taken not to damage the LCD module.
If the LCD breaks, be careful not to get any liquid crystal in your mouth or eyes. In the event of any liquid crystal getting on skin or clothes, wash off immediately with soap and plenty of water.
Do not operate a unit power down, or remove the main battery pack without first ensuring that the data contained in The ReVo's internal memory has first been backed up. Removal of power, will erase all information stored on the internal memory.

Circuit Description

Introduction

The electronic design for the Revo handheld computer product makes use of the ERA architecture based around the WINDEMERE cpu. The product hardware supports Mask ROM builds of 2 to 16 Mbytes and 8Mbytes of DRAM. It features a 480x160 monochrome display with integrated touch panel and a full QWERTY keyboard using carbon pads onto gold plated tracking on the top side of the main PCB. It has a codec for driving a speaker, a docking station for connection to a PC's serial port and an IrDA port. The power for the product comes from rechargable NiMH batteries which are integrated into the product design. These are recharged when Revo is placed on its docking station, or when a 6V DC supply is plugged into its socket.

Shown below is a block diagram of the functional components of Revo



The Revo electronics are contained on one main PCB with the IrDA and Battery interface on a second small PCB in the Battery compartment of the product. By having a separate compartment for the battery, any heat generated by the main PCB does not affect the temperature sensing on the battery pack

Power Control and POR generator

A rechargable NiMH pack is used to power the PCB and this pack is sealed within the product. To ensure that drain upon the battery can be minimised during transportation and shelf life, and that a full reset can be applied to the PCB, it is possible to “Turn Off” the main PCB Vdd rail. Obviously in this state all data would be lost. To generate the nOFF signal the user must activate both buttons (S1 & S2). These are reset style pin activated switches, they are located on the underside of the unit and only accessible when the unit is open.

To turn on the device the user must press the ON button twice, first to enable power to the Vdd rail, and secondly to wakeup the Windemere processor. Windemere requires a 1.5 second delay from its PORb signal before it will wakeup, and therefore it is necessary to wait this time before Revo will activate. If the unit is placed onto the docking station or connected to the DC power, then it will automatically power up the Vdd rail. This means that the User only has to press the ON key once to wake Revo up.

A User Reset (warm/soft reset) signal is available by activating switch (S1) on it’s own.

CPU

The Revo cpu (IC1) is the WINDEMERE device, which integrates an ARM7TDI 32 bit RISC core with Psion specific peripherals. Its main clock input frequency is 3.6864 MHz (+/- 50 ppm), provided by crystal X2 working in fundamental mode. This signal is internally multiplied up in frequency by a factor of 20 and then divided by 2 for a 50/50 Mark/Space ratio of 36.864 MHz (27.12 ns). An internal control register then allows a further divide by 2 of the system clock to operate at 18.432 MHz, which is the default setting on Power Up.

ROM and DRAM Organisation

The DRAM used on Revo is a self-refreshing, EDO (Extended Data Out) 64Mbit DRAM implemented with a 4Mx16 bit wide device, hence providing 16 bit wide data.

Mask ROM Configuration

There are two sites for either an 8MByte 100 pin QFP device (IC10) or upto a 16Mbyte 86 pin TSOP device (IC7). Alternatively two Flash devices can be sited (IC2 and IC3).

Keyboard interface

The Revo keyboard contains a total of 53 keys, organised in a conventional QWERTY arrangement. The keyboard is formed by gold plated pads on the back of the main Revo PCB. Contact is made by a rubber mat with conductive carbon pads.

LCD Module

The LCD module used in Revo is a ready assembled unit consisting of a 480 by 160 pixel passive matrix LCD (normally white pixels) and a Touch Resistive panel. These are constructed into one piece and contained within a metal jacket to provide ESD protection and greater mechanical strength. One 26 way flat flexi connects all these components to the main PCB. All the LCD data, clock and synchronisation signals are provided by the WINDEMERE device.

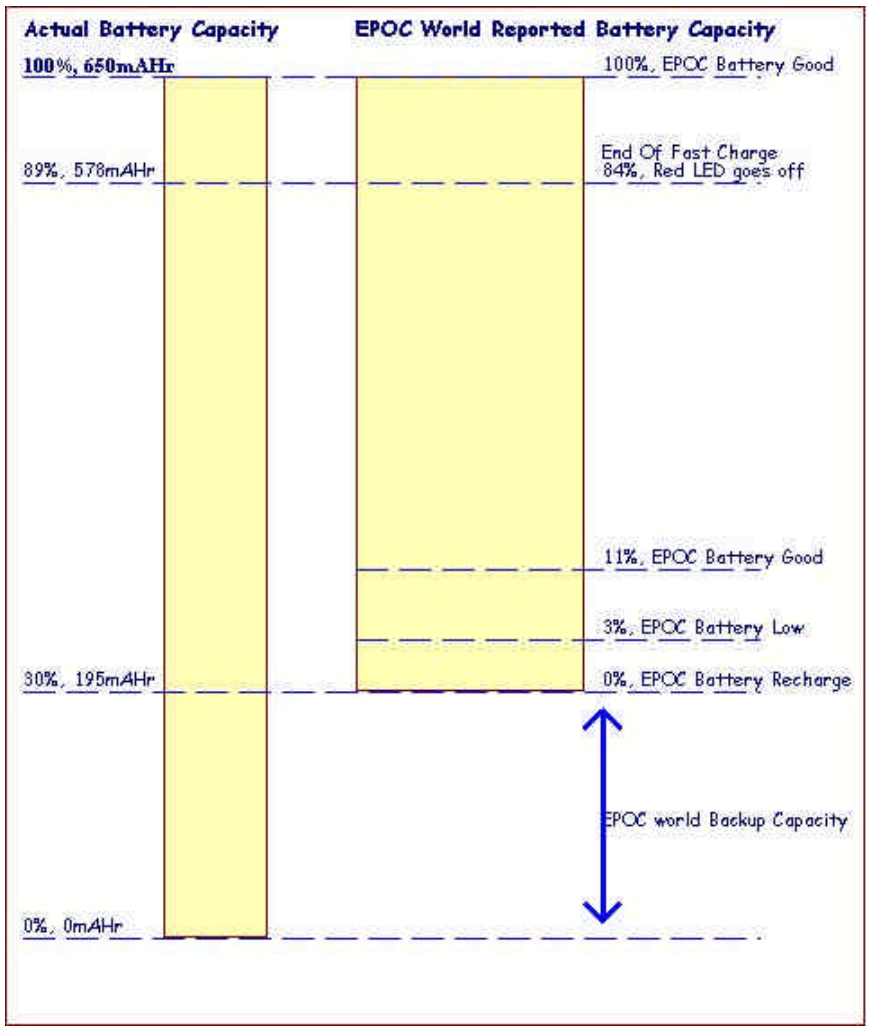
The passive resistive digitiser consists of a glass lower plate and a hardened plastic top plate which is assembled over the LCD screen. Resistive ink is printed on the inside of the digitiser faces and four electrical connections provide the means for sensing resistance across the x- and y- axes. The electrically conductive internal faces of the digitiser are kept apart by means of very small bumps manufactured into the plastic member. Four of the 26 way flat flexi Cable signals carry the Resistive Digitiser planes to the Revo main PCB.

Communications

Revo features both RS232 over cable and IrDA wireless communications

Battery usage

Shown below is a table comparing the real battery capacity and that displayed to the User.



Revo uses a “Gas Gauge” chip to measure the charge put into, and taken out of, the internal NiMH battery pack. From this Gas Gauge a battery charge capacity is calculated and shown to the User. The User will only ever be able to use between 30 and 100% of the Battery’s real capacity which allows the machine to preserve data for upto two weeks. Note that this is shown as a capacity of 0% to 100%.

To the User,

Between 0% and 3% the battery is reported as RECHARGE
Between 3% and 11% the battery is reported as LOW
Above 11% the battery is reported as GOOD

Battery usage

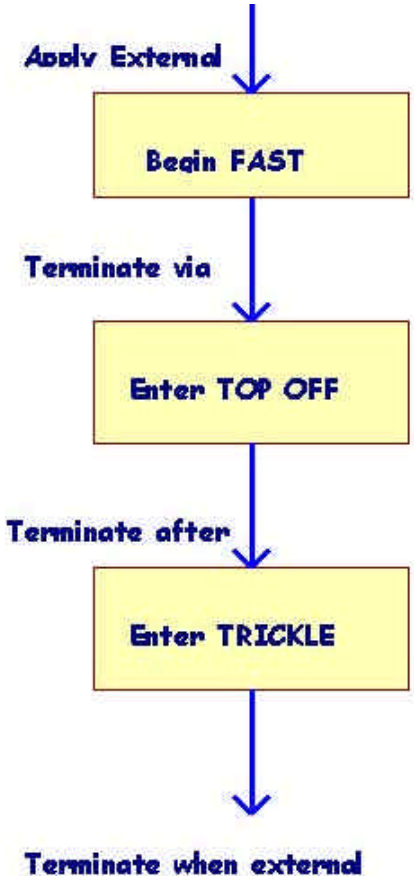
A battery can be charged at three different rates,

Fast
Top Off
Trickle.

Whenever external power is applied, the battery will ALWAYS begin to charge at Fast Charge rate, and the Red LED will come on. Once it reaches a certain point it will terminate Fast Charge and enter a Top Off. It remains in this state to finish charging the last part of the battery for 5 hours.

Important points,

- When the User is told there is 0% capacity, there is actually upto 30% of the battery capacity left. This provides upto 2 weeks of memory backup.
- Fast charge for a completely flat battery takes approximately 1.5 hours.
- The charging cycle will not repeat until External power is removed and re-connected.
- If the battery is already charged above 84% (shown to the user), and the cycle is restarted by removing the External power and re-connecting it, then within 5 minutes it should re-terminate Fast charge and enter Top Off.



Repairing Revo.

Tools required

To repair Revo correctly you will need
2mm Philips jewellers screwdriver
2mm flat jewellers screwdriver
Pliers
Spring hook set (Stock No. 619-200 from RS components or similar)
Craft knife
PCB solvent based cleaning fluid (to remove excess keymat adhesive)
Revo PCB/LCD Removal tool. Part Number 1079000201
N.B. The version of the LCD/PCB extractor tool shown in this manual is a prototype. The final tool works in the same way.

Repairing Revo.

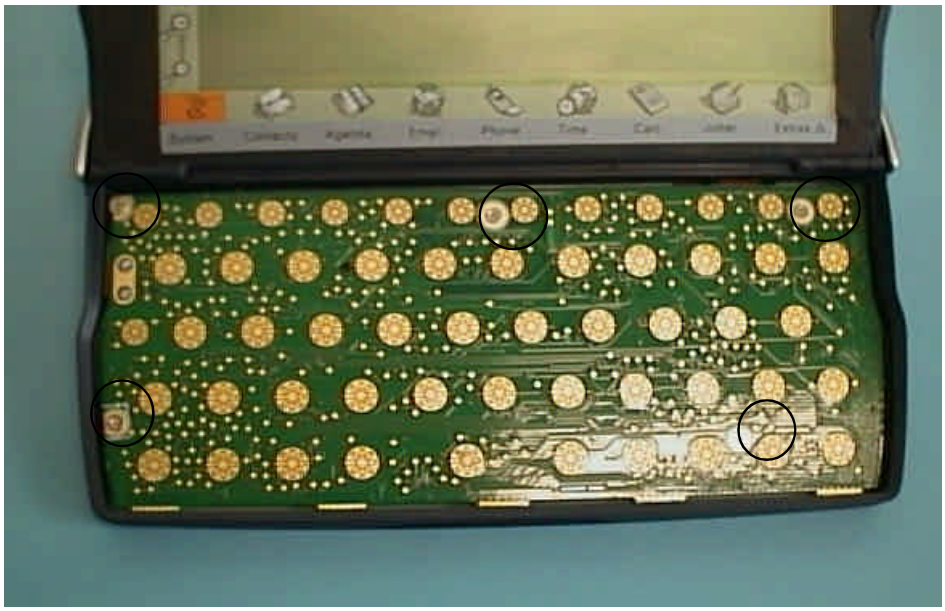
The battery in Revo is permanently connected to the rest of the unit and cannot be removed without opening the unit. This has the potential to cause ESD problems, to get around this there is a procedure to disconnect the power from the unit. You must always do this before attempting any repair, and as this disconnects the power any information stored on the machine should be backed up using a PC.

To disconnect power from the unit insert 2 pins into the reset holes on the base of the unit (only visible when unit is open) labelled 1 and 2. You must press into both holes simultaneously to disconnect the power from the unit, this must be performed for all repairs.

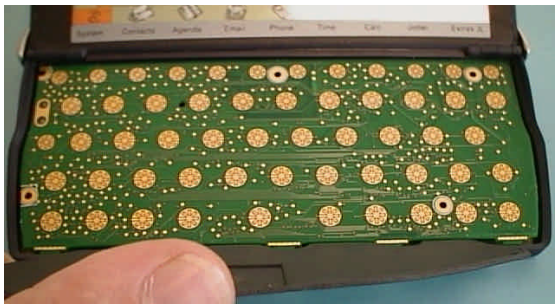
Once the unit is powered down you can begin repairs.
The unit should be considered as two areas of repair, some of these repairs involve the removal of the keymat, some involve the removal of the outer Logo label, and one repair, LCD replacement involves removing both the keymat and the outer Logo.

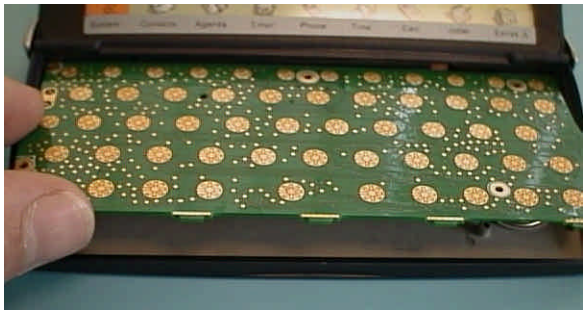
Removing the Keymat, there is no way to do this without destroying the Keymat so do not waste time trying to save it. Pull one of the corner keys (e.g. the Ctrl key) to begin the process, once you can take hold of a corner of the Keymat gently pull the Keymat away from the main PCB. Some adhesive will be left on the PCB, this is unavoidable, and you should use a solvent based cleaner, suitable for PCB use to remove any remaining adhesive.
There should be a label covering one of the 5 screws retaining the PCB, the label reads ‘void’ and is a warranty protection seal, the unit should only be repaired under warranty if this seal is intact.

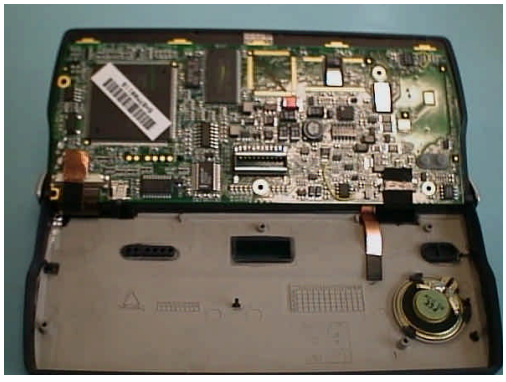
Remove the 5 screws from the PCB.



Using the LCD/PCB Extractor (see Photo) gently lift the rear edge of the PCB upwards and hold it in place, take care not to damage the two Flexi cables attached to the PCB, now lever the front edge of the PCB backwards, the PCB will hinge and lie flat against the LCD. Take care not to damage the PCB or LCD during this operation.

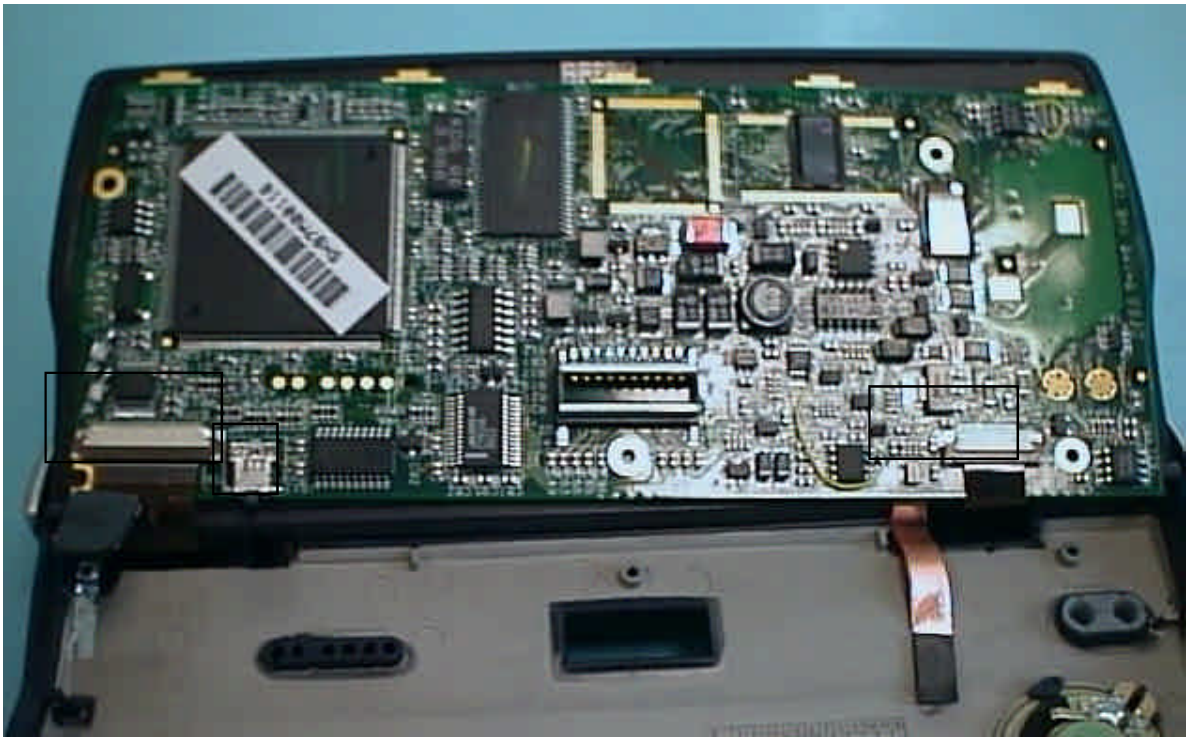






Repairing Revo.

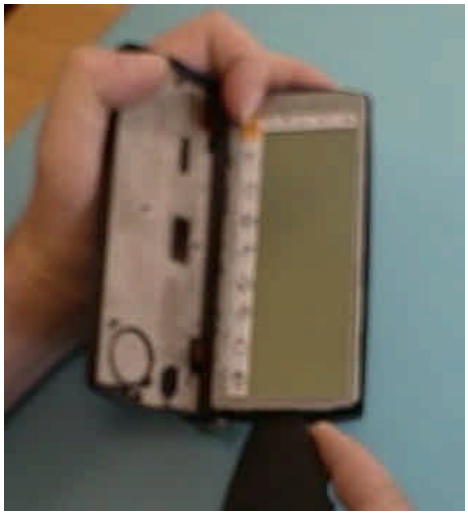
There are 2 Flexi cables attaching the PCB to the LCD and to the power PCB, both Flexi cables have adhesive tape covering the ZIF socket, remove the tape.
Remove the flexis from the ZIF sockets by lifting each Zif socket to open.



You can now remove the PCB.

Fit a new PCB by following the above procedure in reverse, take care when inserting Flexi cables into ZIF sockets. Replace the protective adhesive tape covering the two Zif sockets.
Take care when reseating the PCB, on the upper edge of the PCB there is a microswitch, for detecting if the unit is open or closed, carelessness when replacing the PCB can damage this switch.

If you are replacing the LCD you can now remove the old LCD.
Peel away the bezel label then gently prise the LCD out of its moulding by inserting the edge of the LCD/PCB extractor between top edge of the metal bezel and the moulding, then gently prise the sides of the LCD from the moulding. Lift the LCD out of the moulding (see photos). Take care when removing the flexi cable from the moulding.



To fit a new LCD first feed the flexi cable through the slots in the upper and lower moulding. NOTE, you will have to remove the outer logo label and the hinge pins from the spine moulding to insert the Flexi cable of the new LCD module. Once the Flexi is in place the LCD simply clips into position.
Take care when fitting a new bezel label, they are easily misaligned.

Repairing Revo.

When you have completed your repairs you will need to fit a new keymat.

Caution is advised when replacing the Keymat, it is advised that you do not glue the new Keymat in place immediately. It is sensible to keep an unused spare Keymat to hand, fit the Keymat temporarily, it should work with the adhesive peel strip in place.

Do not glue the Keymat in place until you have reconfigured the PCB using the eeprom programming procedure. (See Revo Final test procedure manual for detail)

Once the PCB is reconfigured and the unit is tested and working correctly carefully position the leading edge of the keymat against the lower edge of the PCB (Front of machine) make sure that all of the keymat edges are positioned correctly and then gently press the keymat into place.

Repairing Revo.

To replace the battery or IrDA/Power PCB first remove the outer logo label and the two hinge pins from underneath.
Partially open the machine, this will cause the spine section to move backwards, freeing the edge of the LCD moulding from the upper spine moulding. Pull the spine away from the main body of the unit.

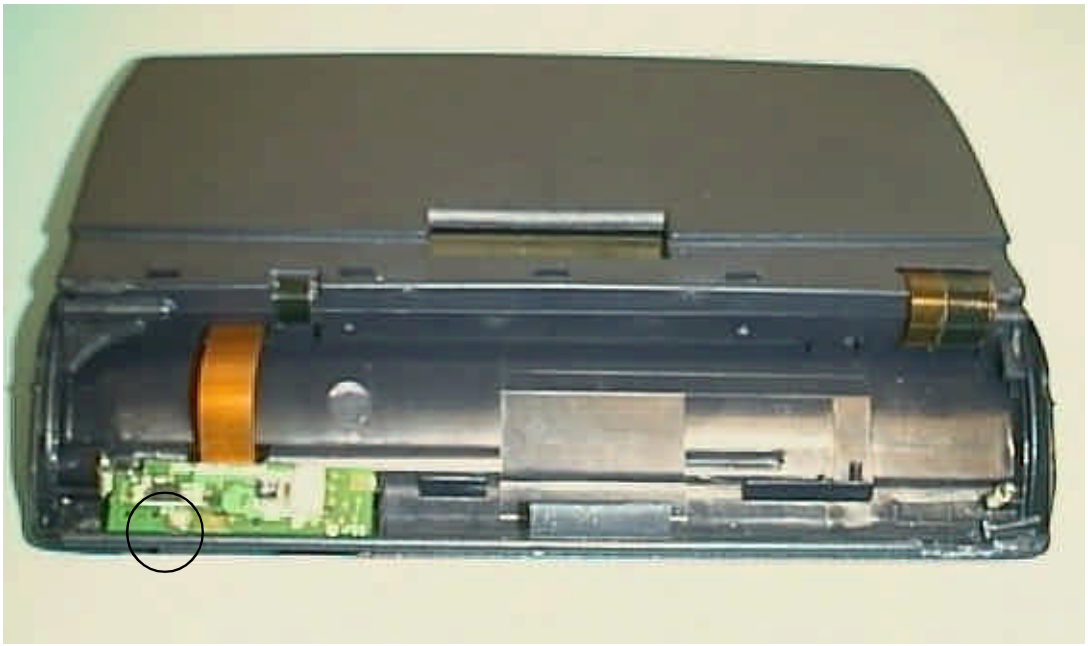
Unclip the two hinge springs from the upper spine moulding, you should take care not to damage these springs as they are heat staked to the lower spine and if damaged the entire moulding must be replaced.

Detatch the spings from the upper posts, use a spring hook for this. Above the left hand spring (when viewed from the front of the machine) there is a sliding hinge pin, you should be able to grip this pin with needle nosed pliers. Pull the pin away from the outer edge of the unit, freeing the left hand corner of the spine. Unclip the upper spine moulding from the lower moulding by gently pulling from the sliding hinge pin end along the rear edge of the spine. The rear right hand corner of the spine is attached to a non moving hinge pin, slide the upper moulding off this pin, leave the pin in the lower spine moulding.

You can now access the battery pack and IrDA/Power PCB and replace either if necessary.

To remove the battery first pull away the tape covering the battery clip, then disconnect the battery from the IrDA/Power PCB, take care not to damage the plug or socket. The battery is clipped in place and can be pulled out of the lower spine moulding.

The IrDA/Power PCB is held in place by one screw, disconnect the battery and remove this screw.



Repairing Revo.

On the underside of the PCB is a ZIF socket with the Power Flexi attached. Remove the protective tape from the ZIF socket, and then remove the Flexi cable. Replacement is a reversal of the removal procedure.

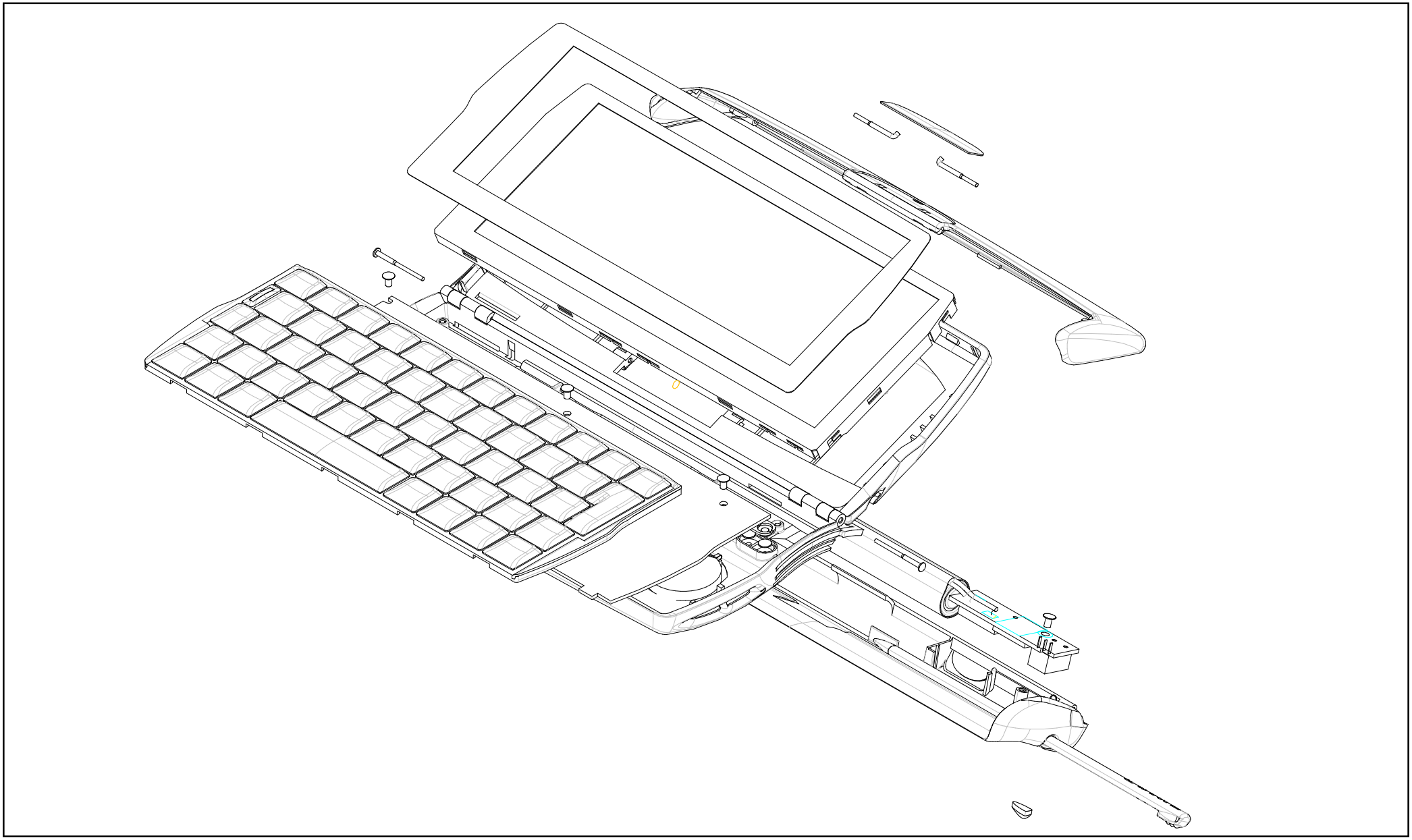
To remove the lower spine moulding first remove the battery and IrDA/Power PCB then gently flex one of the side walls of the lower spine moulding.
This will allow you to disengage the moulding from the slide fins on either side of the main base moulding. Replacement of this part is a reversal of removal, however, you should apply silicone grease to the tracks on the inside of the moulding side walls prior to refitting.

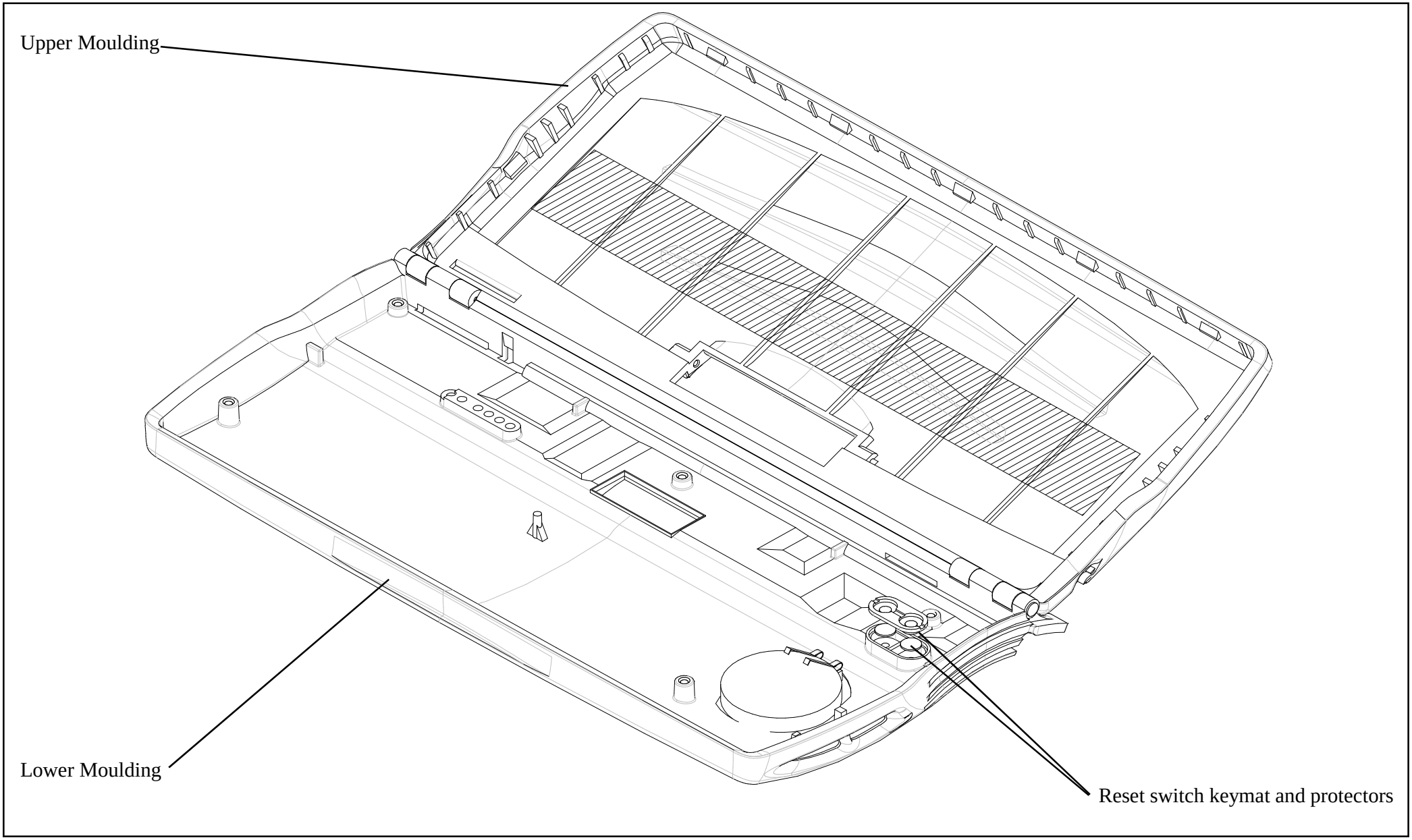
Reassembly Instructions

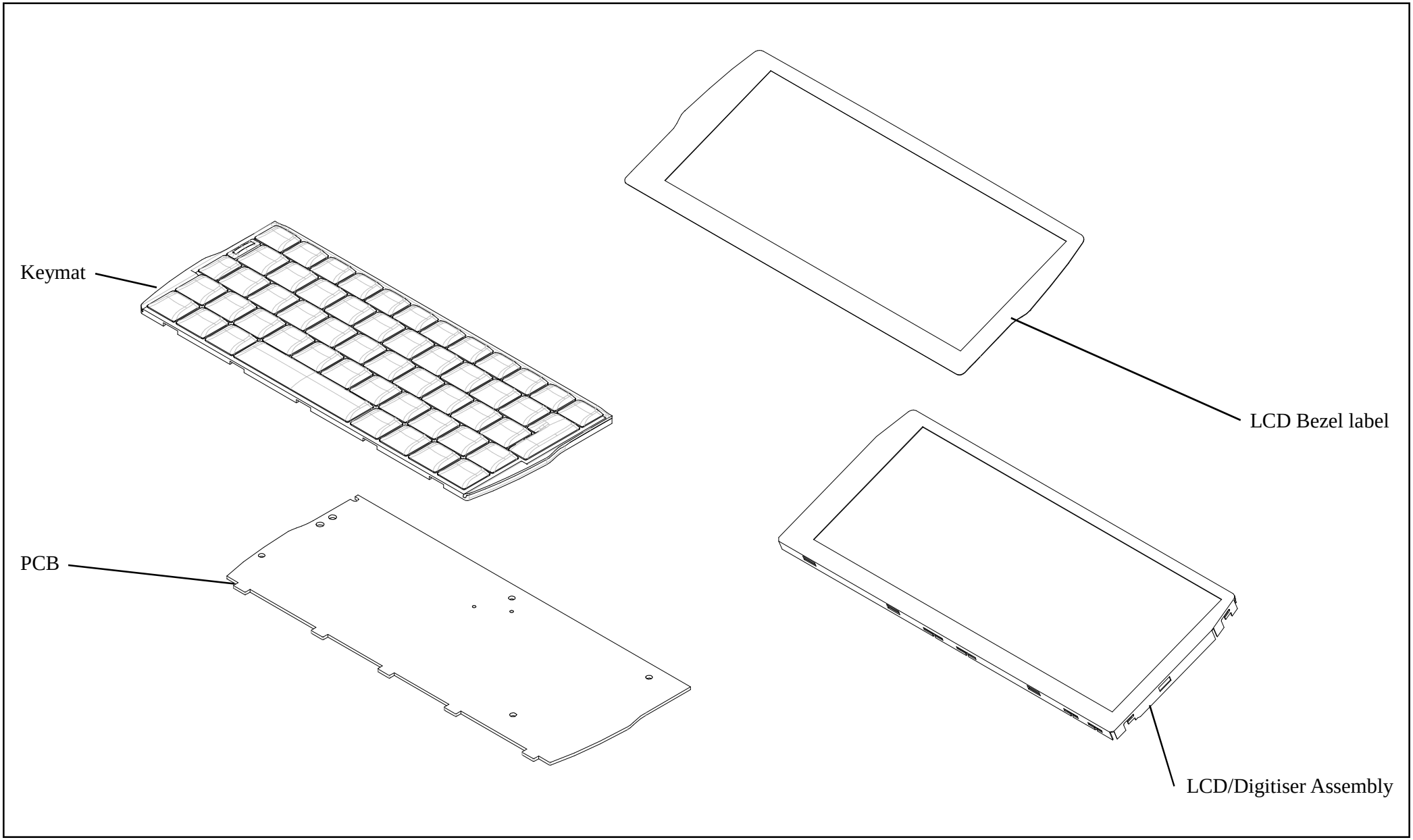
Reassembly is a reversal of the dissasembly proceedure. The difficult task is refitting the hinge springs, this can be made much easier by the use of a spring hook set, although some practice in the use of spring hooks is recommended.
Take note of the following points.
• Exercise caution whilst re-inserting the FFC's into the ZIF sockets.
Inserting FFC's into the connectors at an angle can cause short or open circuits.
Ensure that the bends in the FFC's are retained to ensure correct alignment of all components on the main PCB.
• Replace any labels that have been removed in the disassembly procedure with new labels.
Do not attempt to re-fit a keyboard that has previously been removed from the Revo.

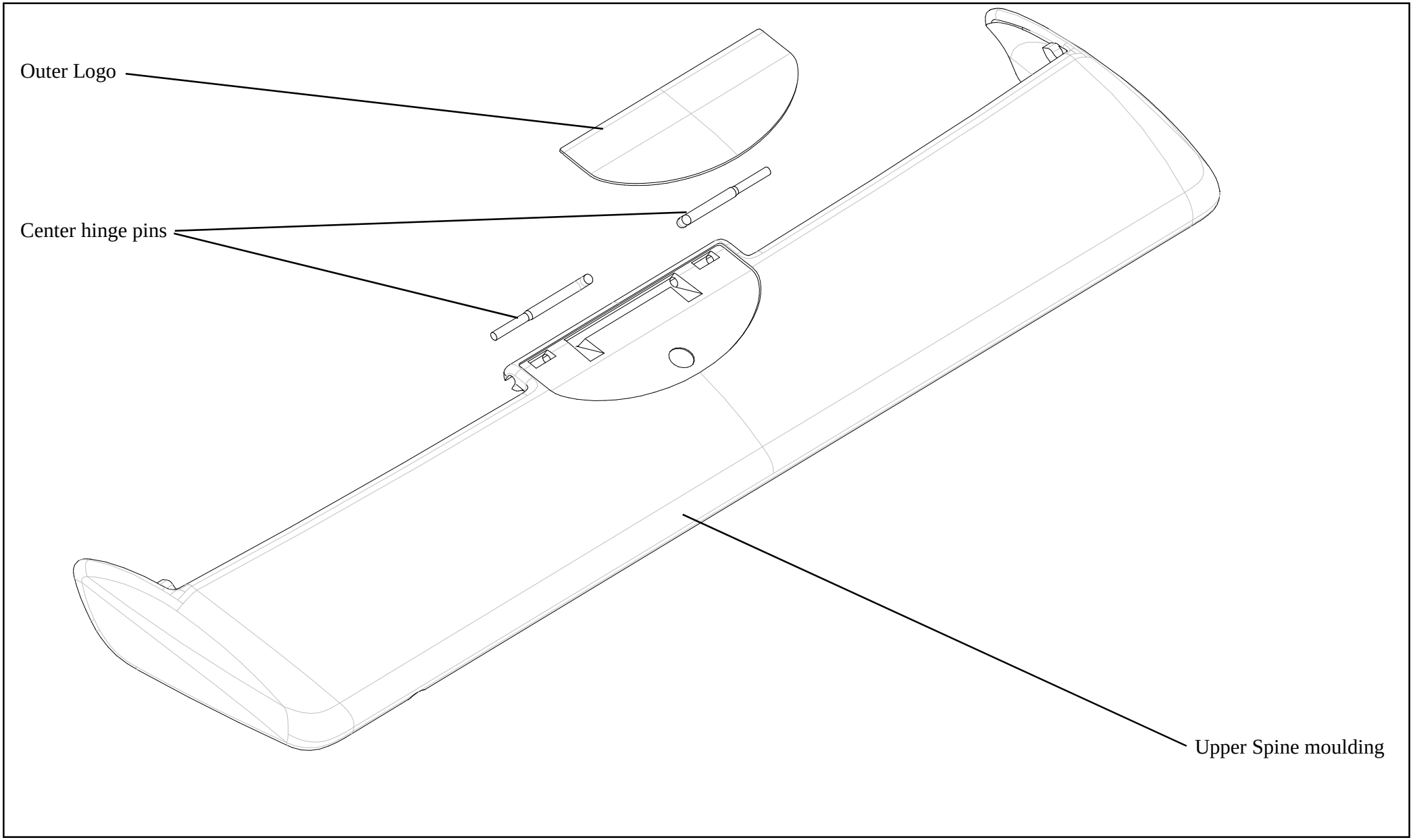
When the Revo is fully reassembled check that the colour of each of the mouldings tie up and that no colour differences exist between mouldings.

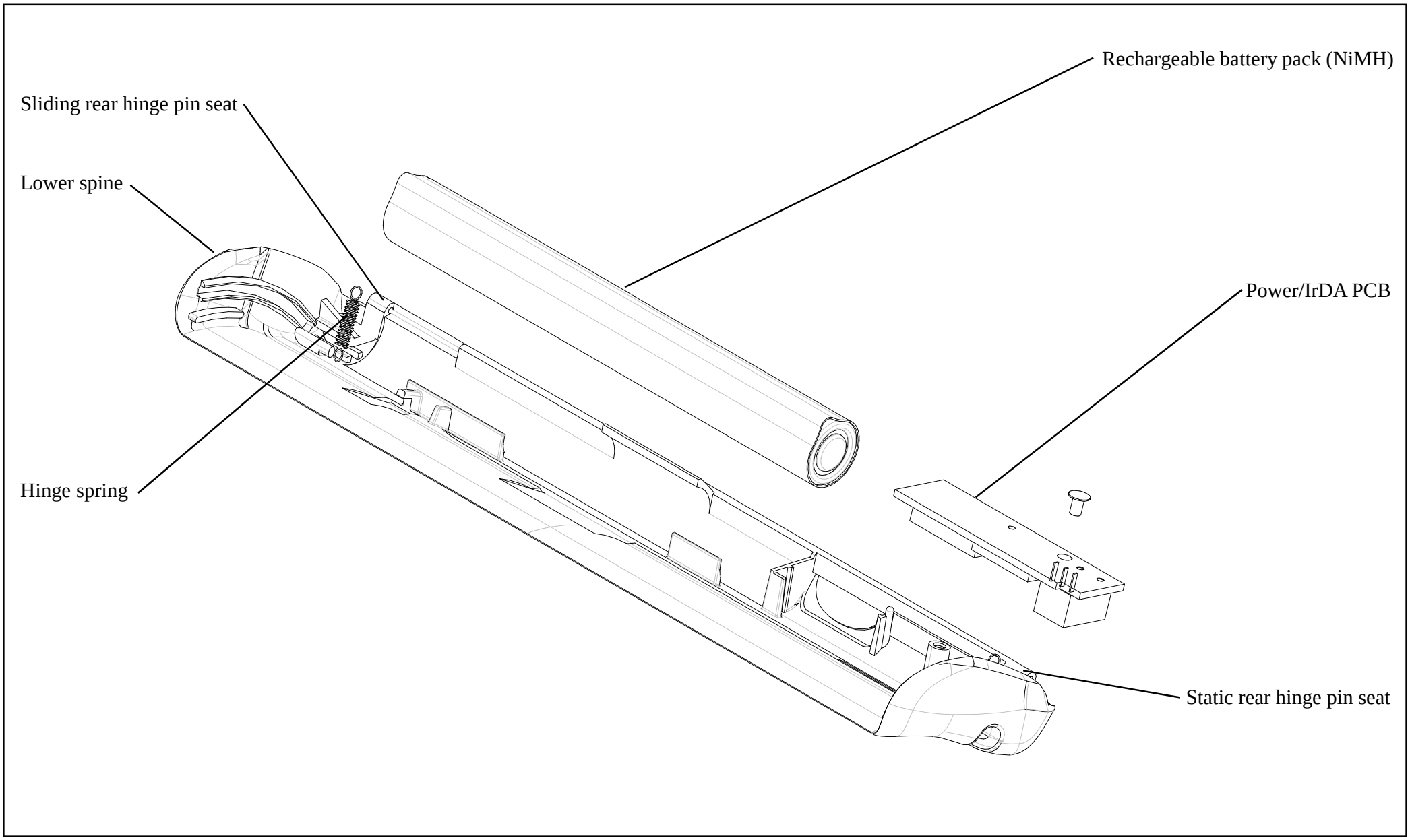
It is important to note that the Revo can occasionally experience a software crash which can be rectified by enacting a soft reset - see User Guide.
However it is possible that a crash can be caused by an intermittent hardware fault, and therefore it is advisable to fully test any unit that has experienced a crash.
Faults such as failure to read links, power supplies or batteries can be caused by the peripherals themselves and these faults should be determined only using a Revo that is known to work.




Upper Moulding
Lower Moulding
Reset switch keymat and protectors


Keymat
LCD Bezel label
PCB
LCD/Digitiser Assembly


Outer Logo
Center hinge pins
Upper Spine moulding


Rechargeable battery pack (NiMH)
Sliding rear hinge pin seat
Lower spine
Power/IrDA PCB
Hinge spring
Static rear hinge pin seat