[1.14] Cleaning a calculator after spills and other accidents

Accidents happen even if you are careful with your calculator. If you spill a drink or liquid into your calculator, such as milk, carbonated beverage or juice, it should be cleaned out, otherwise damage will probably result. Short-term failures include complete failure, sticky or inoperative keys, or intermittent display operation. Even if no immediate failure is evident, the spilled liquid can cause long-term failures through corrosion.

If your calculator is under warrantee or you are not confident in your ability to disassemble your calculator, consider sending it to TI for repair or replacement. Most users have reported that TI is fairly cooperative in working with them.

There is some risk in the cleaning procedure, but if your calculator has failed completely, you have nothing to lose, anyway.

The key principles for a successful cleaning job are to clean the calculator as soon as possible after the spill, clean it thoroughly, and dry it completely and quickly. The purpose of the cleaning process is to remove the contaminants from the calculator components with damaging the calculator. All batteries *must* be removed before attempting a cleaning.

Clean water is probably the best fluid to use to clean a calculator. Other solvents such as alcohol may damage the calculator. While it may seem strange to wash electronics with water, this is common in the electronics industry. At my firm, we have been washing printed circuit boards after assembly, in a dishwasher, for over fifteen years. We have fairly stringent reliability requirements, and the washing process improves reliability by removing the solder flux before conformal coating.

This process has been successful in cleaning a variety of spills:

1. If the calculator seems to be working, back up the calculator memory with GraphLink.
2. Disassemble the calculator. See instructions below.
3. Gently scrub the printed circuit board (PCB) with warm water and a clean toothbrush. Rinse frequently. Use distilled water, or softened water, because hard water will leave calcium deposits. Alternatively, you can secure the parts to be washed in a dishwasher, and run the dishwasher for about ten minutes. Remove the key caps as needed, and wash and rinse them. Wash the circular gold patterns on the display side of the PCB, but try to keep the water away from the display. Wash the rubber keypad sheet; the black bumps make the switch contacts and need to be cleaned well. You may need to pull back the foil shield sheet to thoroughly clean the printed circuit boards (PCBs).
4. Gently dry the washed components with a hair dryer. Avoid over-heating the printed circuit board and plastic parts. The goal of this step is to quickly evaporate the water without damaging the parts from excessive heat.
5. Let the calculator dry for at least 24 hours.
6. Reassemble the calculator. See instructions below.

The instructions below apply to a HW1 TI-89 and a HW2 TI-92+. They may not apply to other hardware versions.

Disassembly and assembly instructions for the TI-89

You will need a small Phillips screwdriver (#0), a Torx T6 driver, and a small flat-blade screwdriver to pry out back-up battery.

Disassembly:

1. Place the calculator face down on a towel or other soft surface.
2. Remove the battery access cover and the four AAA cells.
3. Remove Phillips screw over back-up battery door, then remove the door. Remove the back-up battery. The battery is spring-loaded, so place your finger over the battery as you pry it out, or it may go zinging up in the air, like mine did.
4. Remove the six T-6 Torx fasteners around the outer edge of back of calculator.
5. Remove the back plastic cover: squeeze the edges in at the top of the calculator and pull back until this end pops out. Then gently wiggle it back and forth while pulling back, and the back will pop off fairly easily.
6. Remove the two phillips-head screws holding shield foil.
7. Hold the shield foil back and remove the four phillips-head head screws, under foil. These four screws hold the printed circuit board (PCB) in.
8. Gently remove the PCB. The key caps are loose, so keep the front of the calculator facing down, or they will fall out. Remove any key caps which are stuck to the rubber key sheet, and replace them in the calculator front piece.

Assembly:

1. Install the rubber keypad sheet. Note that the rubber sheet only installs one way. Press all the key 'bumps' into the key caps.
2. Install the PCB in the front cover. Ensure that the black plastic flap at the upper right of the PCB is tucked inside case. Make sure all key caps are still in place.
3. Install the two phillips-head screws through foil shield.
4. Install the four phillips-head screws that hold the PCB.
5. Install the plastic back piece. Align the front and back piece and press them together until they snap closed.
6. Install the six Torx screws.
7. Install the backup battery, (+) side up, and the backup battery door.
8. Install the AAA batteries and the cover.
9. Check the memory with Var-Link, and restore if needed. Note that even if the memory contents seem complete, custom units and custom key assignments may be lost.

Disassembly and assembly instructions for the TI-92+

You will need a T-8 Torx driver and a small Phillips screwdriver or flat-blade screw-driver. A T-9 driver can also be used.

Disassembly:

1. Remove the back plastic cover. Put the calculator face-down on a soft surface.
2. Remove the four AA batteries.
3. Remove the back-up battery clip and backup battery. If the backup battery is held in too tightly, bend the end of a heavy paper clip and use this to pry out the battery.
4. Loosen the 14 T-8 screws which hold the black inner cover. You do not need to completely remove the screws fromt the cover. Lift of back inner cover.
5. Remove the T-8 screw through the foil shield at the upper left of the back-up battery area.
6. Lift out the PCB.

7. Remove the rubber keypad sheet.

Assembly:

1. Install the rubber keypad sheet. Make sure that the plastic alignment pins are through the holes in the keypad sheet.
2. Install the PCB.
3. Install the short T-8 screw through the foil shield.
4. Install the inner back cover and align the screws with the mating holes, then tighten the 14 T-8 screws
5. Install the back-up battery, (+) side up, and the battery cover. Tighten the battery cover screw.
6. Install the (4) AA batteries.
7. Install the back outer cover and fasten the lock.
8. Check the memory with Var-Link, and restore if needed. Note that even if the memory contents seem complete, custom units and custom key assignments may be lost.