



## ISDM (INDEPENDENT SKILL DEVELOPMENT MISSION)

# SOLDERING AND DE-SOLDERING TECHNIQUES

## INTRODUCTION

Soldering and de-soldering are essential techniques in mobile phone repair, used to attach and remove electronic components from the **printed circuit board (PCB)**. These processes involve **melting solder to create electrical connections** and require **precision, skill, and specialized tools**. A well-executed soldering process ensures **strong and durable connections**, while improper soldering can lead to **short circuits, weak joints, or damaged components**.

De-soldering, on the other hand, is crucial when **removing faulty components, replacing damaged ICs (integrated circuits), or performing motherboard repairs**. Since mobile PCBs are **densely packed with micro-components**, technicians must use **careful heat application and proper techniques** to avoid damaging the board.

This chapter covers the **principles of soldering and de-soldering, tools used, step-by-step procedures, safety precautions, common mistakes, and troubleshooting techniques** in mobile phone repair.

## UNDERSTANDING SOLDERING IN MOBILE REPAIR

### What is Soldering?

Soldering is the process of **joining two or more metal components** by melting solder, a metal alloy with a low melting point. The solder creates a **conductive bridge**, ensuring electrical connectivity between components on the **mobile motherboard or circuit board**.

#### TYPES OF SOLDERING USED IN MOBILE PHONE REPAIR:

- ✓ **Soft Soldering:** Uses a low melting point alloy (lead-free or tin-lead solder) and is commonly used for **circuit board components**.
- ✓ **Microsoldering:** A specialized technique used to **repair tiny components, such as resistors, capacitors, and IC chips** on mobile motherboards.
- ✓ **Reflow Soldering:** A method used to **fix loose or cracked solder joints by heating the PCB evenly**.

#### Essential Tools for Soldering in Mobile Repair:

1. **Soldering Iron (15W-35W)** – Heats the solder and creates electrical connections.
2. **Soldering Station** – Offers temperature control for precise heat application.
3. **Solder Wire (Lead-Free or Tin-Lead)** – Creates a bond between electronic components.
4. **Flux (Liquid or Paste)** – Improves solder flow and prevents oxidation.
5. **Soldering Tip Cleaner (Brass Wool or Sponge)** – Removes oxidation from the iron tip.

#### Step-by-Step Soldering Process:

1. **Clean the Work Area & PCB:** Remove dust or oxidation from the soldering points.

2. **Apply Flux:** Helps the solder flow smoothly and prevents oxidation.
3. **Heat the Component Lead & Pad:** Hold the soldering iron tip to the joint for 1-2 seconds.
4. **Apply Solder Wire:** Introduce the solder to the heated pad and component, ensuring it melts properly.
5. **Remove the Iron & Let it Cool:** Allow the solder to solidify, forming a strong connection.

#### EXAMPLE OF SOLDERING IN MOBILE REPAIR:

A loose charging port on a **Samsung Galaxy** phone was fixed by re-soldering the charging pins, restoring normal charging functionality.

#### Common Soldering Mistakes & Solutions:

- ✖ **Too much heat** – Can damage delicate components. (**Solution: Use temperature-controlled soldering stations**).
- ✖ **Cold solder joints** – Poor connections due to improper heating. (**Solution: Ensure solder melts completely before removing the iron.**)
- ✖ **Too much solder** – Can cause short circuits. (**Solution: Apply the right amount for clean joints.**)

#### UNDERSTANDING DE-SOLDERING IN MOBILE REPAIR

##### What is De-Soldering?

De-soldering is the process of **removing soldered components** from a circuit board. It is commonly used when replacing **faulty components, upgrading hardware, or troubleshooting** issues on a mobile PCB.

## Common De-Soldering Scenarios in Mobile Repair:

- ✓ Removing damaged charging ports and headphone jacks.
- ✓ Replacing faulty power ICs or audio ICs.
- ✓ Repairing broken motherboard traces.

## Essential Tools for De-Soldering:

1. **De-Soldering Pump (Solder Sucker):** Removes melted solder from joints.
2. **De-Soldering Wick (Copper Braid):** Absorbs molten solder, leaving a clean PCB pad.
3. **Hot Air Rework Station:** Heats components evenly for removal.
4. **Tweezers & Magnifying Glass:** Helps handle small components with precision.

## Step-by-Step De-Soldering Process:

1. **Apply Flux to the Soldered Joint:** Improves heat transfer and makes solder removal easier.
2. **Heat the Joint with a Soldering Iron or Hot Air Gun:** Use moderate heat to avoid PCB damage.
3. **Use a Solder Sucker or Wick to Remove Solder:** Extract the molten solder efficiently.
4. **Lift the Component Gently:** Use tweezers to remove the component carefully.
5. **Clean the Area with Isopropyl Alcohol:** Ensures a smooth reinstallation process.

## EXAMPLE OF DE-SOLDERING IN MOBILE REPAIR:

A technician removed a **damaged U2 charging IC** from an **iPhone motherboard** using a **hot air rework station and de-soldering wick**, then replaced it with a new IC, restoring normal charging functionality.

### Common De-Soldering Mistakes & Solutions:

- ✖ **Excessive heat** – Can burn PCB traces. (**Solution: Use controlled temperature settings.**)
- ✖ **Applying force to remove components** – Can break delicate circuit pads. (**Solution: Let the solder melt fully before lifting the component.**)
- ✖ **Leaving excess solder residue** – Can cause short circuits. (**Solution: Clean with isopropyl alcohol and a brush.**)

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### CASE STUDY: REPAIRING A MOBILE MOTHERBOARD USING SOLDERING & DE-SOLDERING

**Problem:** A technician received a **dead iPhone 12 Pro** that was not turning on. Diagnosis revealed a **faulty power IC (PMIC)**, which needed replacement.

#### **Solution:**

- ✓ **Step 1:** Used a **digital multimeter** to confirm power failure in the PMIC circuit.
- ✓ **Step 2:** Applied **flux** and used a **hot air rework station** to de-solder the faulty IC.
- ✓ **Step 3:** Cleaned the PCB pads and prepared them for reinstallation.
- ✓ **Step 4:** Soldered a **new PMIC onto the motherboard**, ensuring proper alignment.

✓ **Final Result:** The phone **powered on successfully**, and power management was restored.

**Key Takeaway:** Proper **soldering and de-soldering techniques** are crucial for repairing mobile motherboards without damaging sensitive circuits.

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### Exercise: Test Your Knowledge

1. What is the function of flux in soldering?
  2. Name two essential tools used in de-soldering.
  3. What precautions should be taken while using a hot air rework station?
  4. Why is temperature control important in microsoldering?
  5. What is a common issue caused by excess solder application?
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### CONCLUSION

Soldering and de-soldering are **critical skills** for mobile phone technicians, allowing them to **replace, repair, and restore** faulty components effectively. Proper **heat control, precision techniques, and the use of quality tools** ensure strong and reliable solder joints.

As mobile phones become **more compact and complex**, advanced **microsoldering and reflow techniques** will continue to play an essential role in mobile hardware repairs

# MICROSOLDERING & COMPONENT-LEVEL REPAIR

## INTRODUCTION

Microsoldering and component-level repair are advanced techniques used in **mobile phone hardware repair** to fix **damaged circuit boards, replace faulty chips, and restore electrical connections** at a microscopic level. Unlike traditional soldering, **microsoldering requires precision tools, a controlled heat source, and specialized techniques** to work with small components such as **integrated circuits (ICs), capacitors, resistors, and microchips**.

With modern smartphones becoming **more compact and tightly integrated**, technicians must master **microsoldering techniques** to repair **power management ICs (PMICs), display connectors, charging ports, and CPU-related faults** without damaging surrounding components.

This chapter explores the **fundamentals of microsoldering, tools used, step-by-step repair techniques, safety measures, common issues, and case studies** that demonstrate its importance in mobile phone repair.

## UNDERSTANDING MICROSOLDERING IN MOBILE REPAIR

### What is Microsoldering?

Microsoldering is a **high-precision soldering technique** used to repair **small electronic components** on a **PCB (Printed Circuit Board)**. It involves the use of **fine-tipped soldering irons, microscopes, and hot air rework stations** to work on **tiny surface-mounted devices (SMDs) and integrated circuits (ICs)**.

## Key Features of Microsoldering:

- ✓ Works with **micro-sized electronic components** on the motherboard.
- ✓ Uses **low-temperature controlled heat** to prevent circuit board damage.
- ✓ Requires **advanced tools** like hot air rework stations, solder paste, and flux.
- ✓ Essential for **component-level repairs**, such as IC replacements and trace repair.

## COMMON REPAIRS USING MICROSOLDERING:

- ✓ **Charging Port Repair** – Replacing a damaged USB-C or Lightning connector.
- ✓ **Battery Connector Repair** – Fixing broken battery terminals on the PCB.
- ✓ **Power IC Replacement** – Replacing a faulty PMIC (Power Management IC).
- ✓ **Backlight IC Repair** – Fixing no-display issues caused by backlight circuit failure.
- ✓ **Touch IC Repair** – Repairing unresponsive touchscreens due to a faulty Touch IC.

## Example of Microsoldering in Mobile Repair:

A technician repaired a **water-damaged iPhone 12** that had a faulty **backlight IC**. Using microsoldering, the damaged IC was removed, and a new one was installed, restoring the display functionality.

## Common Mistakes in Microsoldering:

- ✖ Overheating components, leading to PCB damage.
  - ✖ Applying too much solder, causing short circuits.
  - ✖ Incorrect alignment of ICs, resulting in faulty connections.
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## ESSENTIAL TOOLS FOR MICROSOLDERING

### 1. Hot Air Rework Station

A hot air rework station is used to **heat and remove surface-mounted components (SMDs)** without damaging nearby parts. It allows controlled temperature adjustments to prevent **burning the PCB**.

- ✓ Used for **IC removal, reflow soldering, and trace repairs**.
- ✓ Common brands: **Quick 861DW, Hakko FR-301, JBC JTSE-2A**.

### 2. Microsoldering Iron

A **fine-tipped soldering iron** with **temperature control** is used to work on **tiny PCB connections** without overheating.

- ✓ Best for **micro component reattachment, fine soldering, and small joint repairs**.
- ✓ Common brands: **Hakko FX-951, JBC NanoStation, Weller WXMP**.

### 3. Solder Paste & Flux

- ✓ **Solder Paste** – A mix of tiny solder particles and flux used for **precise soldering**.
- ✓ **Flux (Rosin or Liquid)** – Ensures **smooth solder flow and prevents oxidation**.

### 4. Microscope for PCB Inspection

A microscope (**10x–50x magnification**) is used to inspect **solder joints, motherboard traces, and IC connections**.

- ✓ Popular choices: **AmScope, Andonstar Digital Microscope.**

### Example of Tool Usage:

A technician repairing a **broken CPU power line** on an **iPhone 11 Pro Max** used a **Hakko FX-951 soldering station** with **lead-free solder paste** to rebuild the missing trace.

## Step-by-Step Microsoldering & Component-Level Repair Process

### Step 1: Diagnosing the Fault

- ✓ Use a **digital multimeter** to check voltage levels and continuity.
- ✓ Inspect the PCB under a **microscope** to find cracked solder joints or damaged ICs.

### Step 2: Preparing the Work Area

- ✓ Use an **anti-static mat** to protect the motherboard.
- ✓ Clean the damaged area using **isopropyl alcohol**.

### Step 3: Removing the Faulty Component

- ✓ Apply **flux** around the component.
- ✓ Heat the area using a **hot air rework station** (250–300°C for IC removal).
- ✓ Use **tweezers** to lift the component once the solder melts.

### Step 4: Preparing the PCB Pads

- ✓ Clean **old solder** using a **desoldering wick**.
- ✓ Apply **new solder paste and flux** to prepare for new component installation.

### Step 5: Soldering the New Component

- ✓ Place the **new IC or component** on the board.
- ✓ Heat evenly using the **hot air station** until the solder flows.
- ✓ Inspect under a **microscope** to confirm proper alignment.

### Step 6: Testing the Repair

- ✓ Use a **multimeter** to check continuity and voltage.
- ✓ Reassemble the phone and **power it on to test functionality**.
  - ◆ **Example:** A technician repaired a **damaged Wi-Fi IC** in a **Samsung Galaxy S21 Ultra** by carefully **desoldering the faulty IC** and **soldering a new one**, restoring Wi-Fi connectivity.

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### CASE STUDY: REPLACING A POWER IC USING MICROSOLDERING

**Problem:** An **iPhone 13** was not turning on, even after a battery replacement. Diagnosis showed that the **power management IC (PMIC)** was faulty.

- ✓ **Step 1:** The technician checked the motherboard using a multimeter and found a **short circuit near the PMIC**.
- ✓ **Step 2:** A **hot air station** was used to **safely remove the faulty PMIC**.
- ✓ **Step 3:** The **PCB pads were cleaned and prepared** for the new IC.
- ✓ **Step 4:** The new **PMIC was soldered onto the motherboard** using **microsoldering techniques**.

✓ **Final Result:** The phone **powered on successfully**, confirming a successful repair.

**Key Takeaway:** Advanced **microsoldering techniques** allow technicians to fix **complex motherboard failures** without needing a full board replacement.

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### Exercise: Test Your Knowledge

1. What is the purpose of flux in microsoldering?
  2. Name two essential tools used in microsoldering.
  3. How does a microscope assist in PCB repair?
  4. What is the ideal temperature for removing ICs using a hot air rework station?
  5. What is a common mistake that can cause short circuits during microsoldering?
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### CONCLUSION

Microsoldering and component-level repair are **essential skills** for mobile repair professionals, enabling them to **fix damaged circuits, replace faulty ICs, and restore broken connections**. These techniques require **precision, the right tools, and experience** to ensure **successful repairs without damaging delicate PCB components**.

With modern smartphones becoming **more compact and complex**, mastering **microsoldering techniques** will be a valuable skill in the future of **mobile phone repair and hardware development**.

# IC REPLACEMENT TECHNIQUES

## INTRODUCTION

Integrated Circuits (ICs) are essential components in mobile phones, responsible for **power management, signal processing, connectivity, and device functionality**. Over time, these ICs can fail due to **physical damage, overheating, moisture exposure, or electrical faults**. Replacing faulty ICs is a **critical repair process** that requires **precision, skill, and specialized tools** to ensure successful restoration without damaging the motherboard.

IC replacement involves **desoldering the faulty IC, preparing the PCB pads, and soldering a new IC onto the board** using techniques like **hot air rework, reballing, and direct soldering**. This chapter explores the **step-by-step process, essential tools, troubleshooting methods, and safety precautions** involved in IC replacement.

## UNDERSTANDING ICs IN MOBILE PHONES

### What is an Integrated Circuit (IC)?

An Integrated Circuit (IC) is a **miniature electronic circuit** embedded within a single semiconductor chip. It consists of **transistors, resistors, capacitors, and diodes**, working together to perform specific functions within a smartphone.

### Types of ICs in Mobile Phones:

- ✓ **Power Management IC (PMIC):** Controls power distribution and battery charging.
- ✓ **CPU & GPU IC:** Manages processing and graphics rendering.

- ✓ **Charging IC:** Regulates voltage input from chargers.
- ✓ **Baseband IC:** Handles mobile network communication.
- ✓ **Touch IC:** Processes touchscreen inputs.
- ✓ **Wi-Fi/Bluetooth IC:** Controls wireless connectivity functions.

#### COMMON CAUSES OF IC FAILURE:

- ✓ **Overheating:** Excessive heat can damage IC circuits over time.
- ✓ **Water Damage:** Moisture can cause **short circuits** and corrosion.
- ✓ **Electrical Surges:** Voltage fluctuations can burn IC components.
- ✓ **Physical Impact:** Drops or pressure can crack IC solder joints.

#### Example of IC Failure:

A **Samsung Galaxy S20** stopped detecting Wi-Fi networks due to a **damaged Wi-Fi IC**. The technician performed an **IC replacement**, restoring wireless connectivity.

#### ESSENTIAL TOOLS FOR IC REPLACEMENT

##### 1. Hot Air Rework Station

A **hot air rework station** provides **controlled heat** to remove and replace ICs safely.

- ✓ Used for **desoldering and resoldering ICs**.
- ✓ Temperature should be **250°C–350°C**, depending on IC type.

##### 2. Microsoldering Iron

- ✓ A **fine-tipped soldering iron** used for **cleaning PCB pads and reattaching small components**.

##### 3. Solder Paste & Flux

✓ **Solder Paste:** Contains microscopic solder balls, ensuring proper contact between IC and PCB.

✓ **Flux:** Helps solder flow evenly and prevents oxidation.

#### 4. PCB Cleaning Tools

✓ **Isopropyl Alcohol (IPA)** – Cleans PCB pads before and after soldering.

✓ **Brush & Lint-Free Cloth** – Removes dust and residue.

#### 5. Reballing Kit

✓ Used when replacing **Ball Grid Array (BGA) ICs**, ensuring proper alignment and connectivity.

#### Example of Tool Usage:

A technician replaced a **damaged Power Management IC (PMIC)** on an **iPhone 12 Pro** using a **hot air rework station, flux, and new solder balls**, restoring normal power distribution.

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### STEP-BY-STEP IC REPLACEMENT PROCESS

#### Step 1: Diagnosing the Faulty IC

✓ Use a **digital multimeter** to test voltage across the IC.

✓ Inspect the IC under a **microscope** for physical damage or corrosion.

✓ If the IC **overheats abnormally**, it may indicate internal failure.

#### Step 2: Preparing the Work Area

✓ Use an **anti-static mat** to prevent electrical damage.

✓ Clean the PCB with **isopropyl alcohol (IPA)** to remove dust and oxidation.

### Step 3: Removing the Faulty IC

- ✓ Apply **flux** around the IC to ensure smooth desoldering.
- ✓ Set the **hot air rework station** to **280°C–350°C**.
- ✓ Heat the IC evenly for **15–20 seconds** until the solder melts.
- ✓ Gently lift the IC using **tweezers**.

### Step 4: Cleaning and Preparing the PCB Pads

- ✓ Use a **desoldering wick** and **soldering iron** to remove old solder.
- ✓ Clean the area with **flux** and **isopropyl alcohol**.
- ✓ Apply **new solder paste** to prepare for the new IC.

### Step 5: Installing the New IC

- ✓ Place the new IC onto the PCB, ensuring proper alignment.
- ✓ Apply heat using the **hot air rework station** until the solder flows.
- ✓ Allow the solder to cool naturally before testing.

### Step 6: Testing the Repair

- ✓ Use a **multimeter** to check voltage continuity.
- ✓ Power on the device and verify if the issue is resolved.
  - ◆ **Example:** A technician successfully replaced the **charging IC** on an **iPhone XR** after diagnosing a **charging failure**, restoring the device's ability to charge normally.

## REBALLING PROCESS FOR BGA ICs

### What is Reballing?

Reballing is a specialized technique used for **Ball Grid Array (BGA)** ICs, which do not have traditional pins. Instead, these ICs use **tiny solder balls underneath** for electrical connections.

### Reballing Process:

- ✓ Remove the old IC using a **hot air rework station**.
- ✓ Clean the PCB pads with **flux and solder wick**.
- ✓ Apply a **stencil and solder paste** to create new solder balls.
- ✓ Heat evenly until the solder balls form correctly.
- ✓ Place the **reballled IC** onto the board and reflow it using heat.
  - ◆ **Example:** A technician performed **CPU reballing** on an **iPhone 11 Pro Max** to fix an **unresponsive device**, successfully restoring its functionality.

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### COMMON MISTAKES IN IC REPLACEMENT & SOLUTIONS

- ✗ **Overheating the PCB** – Can damage nearby components.  
✓ **Solution:** Use **controlled temperature** and avoid excessive heat exposure.
- ✗ **Misalignment of ICs** – Leads to improper connections.  
✓ **Solution:** Use a **microscope to align ICs correctly** before soldering.
- ✗ **Not cleaning PCB pads properly** – Can cause weak solder joints.  
✓ **Solution:** Always clean the area with **isopropyl alcohol and flux** before reinstallation.

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### CASE STUDY: REPLACING A DAMAGED BASEBAND IC

### Problem:

An **iPhone 12 Pro Max** displayed "**No Service**" due to a faulty **Baseband IC**. The technician performed an IC replacement to restore network functionality.

### Repair Process:

- ✓ **Step 1:** Checked network settings and confirmed **baseband failure**.
  - ✓ **Step 2:** Used a **hot air rework station** to remove the faulty IC.
  - ✓ **Step 3:** Cleaned the PCB pads with **flux and solder wick**.
  - ✓ **Step 4:** Replaced the Baseband IC and heated it to form strong solder joints.
  - ✓ **Final Result:** The phone **successfully connected to mobile networks**, confirming a successful repair.
- ◆ **Key Takeaway:** A damaged **Baseband IC can cause signal issues**, requiring precision IC replacement to restore functionality.

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### Exercise: Test Your Knowledge

1. What is the function of a Power Management IC (PMIC)?
2. Why is flux used in IC replacement?
3. What is the recommended temperature for removing ICs using a hot air station?
4. What are the steps involved in reballing a BGA IC?
5. Why is proper alignment important when replacing an IC?

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### CONCLUSION

IC replacement is a **highly technical process** that requires **precision tools, steady hands, and expert knowledge** of mobile phone circuit boards. By mastering **IC removal, reballing, and resoldering techniques**, technicians can **repair complex motherboard failures** without replacing entire devices.

With the increasing complexity of mobile hardware, **IC-level repairs** will continue to play a crucial role in **smartphone maintenance, troubleshooting, and refurbishment**.

ISDMINDIA

# JUMPER WIRE REPAIR FOR BROKEN TRACKS

## INTRODUCTION

Mobile phone circuit boards, also known as **Printed Circuit Boards (PCBs)**, are complex electronic pathways that connect various components such as the **processor, power IC, memory, and display connectors**. Over time, these tracks can get damaged due to **physical stress, water damage, overheating, or improper repairs**, leading to circuit discontinuity.

Jumper wire repair is an advanced technique used by **mobile repair technicians** to **bridge broken PCB tracks** and restore electrical connections. This method involves **identifying the damaged track, using ultra-thin jumper wires, and securely soldering them to reconnect the circuit**.

In this chapter, we will explore **jumper wire repair techniques, essential tools, step-by-step procedures, common mistakes, troubleshooting tips, and real-world case studies**.

## Understanding PCB Tracks and Jumper Wire Repair

### What are PCB Tracks?

PCB tracks are **thin conductive pathways (usually made of copper)** that carry electrical signals between various components on a circuit board. These tracks are **delicate and can break** due to:

- ✓ Overheating caused by power surges.
- ✓ Moisture exposure leading to corrosion.
- ✓ Accidental damage during repairs.
- ✓ Manufacturing defects causing weak solder joints.

## WHAT IS JUMPER WIRE REPAIR?

Jumper wire repair is a **manual rewiring technique** where **thin copper wires** are used to **bypass broken PCB tracks** and restore connectivity between electronic components.

### Applications of Jumper Wire Repair in Mobile Repair:

- ✓ Restoring charging circuits by reconnecting broken power lines.
- ✓ Repairing backlight circuits when display issues occur due to track damage.
- ✓ Fixing audio and microphone circuits by bridging damaged traces.
- ✓ Repairing no power/no network issues by reconnecting motherboard components.

### Example of Jumper Wire Repair in Mobile Phones:

A **Samsung Galaxy S21 Ultra** experienced **no charging** due to a broken track between the charging port and the **Power Management IC (PMIC)**. A **jumper wire was soldered** to restore the connection, allowing the phone to charge again.

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### Essential Tools for Jumper Wire Repair

#### 1. Fine Jumper Wires

- ✓ **Copper jumper wires (0.02mm - 0.1mm thickness)** used for micro-circuit connections.
- ✓ **Enamel-coated wires** prevent short circuits and unwanted electrical contact.

#### 2. Digital Multimeter

- ✓ Used to check **continuity** between two points and locate broken tracks.

### 3. Soldering Iron with Fine Tip

- ✓ **15W-35W microsoldering iron** is needed for precise work.
- ✓ **Best brands:** Hakko FX-951, JBC CD-2SHE.

### 4. Flux and Solder Paste

- ✓ **Flux improves solder adhesion** and prevents oxidation.
- ✓ **Solder paste ensures smooth soldering joints.**

### 5. PCB Cleaning Materials

- ✓ **Isopropyl Alcohol (IPA)** – Cleans flux residue.
- ✓ **Anti-static brush** – Removes dust and oxidation.

### 6. Microscope or Magnifying Glass

- ✓ Helps in **inspecting microscopic PCB tracks** for accurate repairs.

- ◆ **Example of Tool Usage:**

A technician repairing a **broken track** in the **SIM card circuit** of an **iPhone 12 Pro** used **0.02mm jumper wire**, a **Hakko soldering iron**, and **isopropyl alcohol** to complete the repair.

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## Step-by-Step Jumper Wire Repair Process

### Step 1: Diagnosing the Broken Track

- ✓ Use a **digital multimeter (continuity mode)** to test whether electrical signals pass through the suspected track.
- ✓ If there is **no continuity**, the track is broken and needs repair.
- ✓ Inspect under a **microscope** for visible track damage.

- ◆ **Example:** A technician diagnosed an iPhone XR with **no backlight** and found that the backlight circuit track was **damaged due to overheating**.
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## Step 2: Preparing the PCB for Repair

- ✓ Clean the damaged area using **isopropyl alcohol (IPA)** to remove dust and oxidation.
  - ✓ Apply a **small amount of flux** to improve solder flow.
- ◆ **Example:** A corroded charging track on a **Samsung Note 10** was cleaned with **flux and an anti-static brush** before applying the jumper wire.
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## Step 3: Exposing and Prepping the Track Ends

- ✓ Use a **scalpel or fine sandpaper** to carefully **scrape off the PCB coating** from the broken track ends.
  - ✓ Ensure **copper pads are visible and shiny** for proper solder adhesion.
- ◆ **Example:** A technician repairing a **broken Wi-Fi antenna track** on an **iPhone 11** used **a scalpel to expose the copper track ends before soldering the jumper wire**.
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## Step 4: Soldering the Jumper Wire

- ✓ Cut a **thin copper wire** (0.02mm-0.05mm) to the required length.
- ✓ Tin the wire with **solder and flux** for a stronger connection.

- ✓ Hold the wire in place and **gently solder it to both track ends** using a **fine-tipped soldering iron**.

◆ **Example:** A damaged SIM card track on a OnePlus 8 Pro was repaired using a **0.03mm jumper wire** and precision **microsoldering techniques**.

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### Step 5: Securing the Jumper Wire

- ✓ Use a **small amount of UV glue or adhesive** to secure the wire.  
✓ Ensure the wire does not touch any surrounding components.  
✓ Allow the glue to cure before reassembling the phone.

◆ **Example:** After repairing a **broken speaker circuit track** on an **iPhone 13 Pro**, a technician used **UV glue** to keep the jumper wire in place.

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### Step 6: Testing the Repair

- ✓ Use a **multimeter** to check continuity.  
✓ Reassemble the phone and **power it on**.  
✓ Test the repaired circuit to confirm functionality.
- ◆ **Example:** A non-functional volume button circuit on a Google Pixel 6 was restored by testing **continuity with a multimeter after jumper wire repair**.
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## COMMON MISTAKES IN JUMPER WIRE REPAIR & SOLUTIONS

- ✗ **Using thick wires** – Can cause short circuits.  
✓ **Solution:** Use **ultra-thin jumper wires (0.02mm-0.05mm)**.

✖ **Applying excess solder** – May damage surrounding components.

✓ **Solution:** Use minimal solder and precise heating techniques.

✖ **Not securing the wire properly** – Can lead to disconnections over time.

✓ **Solution:** Apply UV glue or tape to hold the jumper wire in place.

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### CASE STUDY: RESTORING A BROKEN CHARGING CIRCUIT WITH JUMPER WIRE REPAIR

#### Problem:

A **Huawei P30 Pro** was not charging. A technician diagnosed a **broken charging track** between the **charging port** and **PMIC**.

#### Repair Process:

- ✓ **Step 1:** Used a multimeter to confirm the broken track.
- ✓ **Step 2:** Cleaned the area with flux and isopropyl alcohol.
- ✓ **Step 3:** Exposed the copper track using a scalpel.
- ✓ **Step 4:** Soldered a **0.03mm copper jumper wire** between the charging port and PMIC.
- ✓ **Step 5:** Secured the wire with **UV glue**.
- ✓ **Final Result:** The phone **started charging again**, confirming a successful repair.

- ◆ **Key Takeaway:** Jumper wire repair is a reliable solution for restoring damaged PCB tracks and fixing critical circuit failures.

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### Exercise: Test Your Knowledge

1. What is the primary purpose of jumper wire repair in PCB repairs?
2. Why is flux used before soldering a jumper wire?
3. What is the recommended thickness of a jumper wire for mobile phone PCB repair?
4. How can a technician identify a broken PCB track?
5. Why is it important to secure a jumper wire after soldering?

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## CONCLUSION

Jumper wire repair is an **essential technique for mobile repair technicians**, allowing them to **restore broken circuit tracks and repair non-functional components** without replacing the entire motherboard. By using **fine jumper wires, proper soldering techniques, and testing methods**, technicians can successfully **fix power, display, and connectivity-related failures**, extending the lifespan of smartphones.

# REBALLING OF ICs

## INTRODUCTION

Integrated Circuits (ICs) are vital components in modern mobile phones, responsible for managing **power distribution, network connectivity, display processing, and system performance**. Many ICs, particularly **Ball Grid Array (BGA) ICs**, rely on tiny solder balls to form electrical connections with the **motherboard (PCB - Printed Circuit Board)**. Over time, these solder balls can degrade due to **excessive heat, physical stress, or manufacturing defects**, leading to malfunctions such as **no power, network failures, display issues, or charging problems**.

Reballing is the process of **removing, cleaning, and replacing the tiny solder balls on an IC** before reinstalling it onto the motherboard. This technique is essential for **restoring damaged IC connections** without replacing the entire motherboard, making it a cost-effective solution for advanced mobile repair technicians.

This chapter explores **the fundamentals of IC reballing, essential tools, step-by-step techniques, common troubleshooting methods, and real-world case studies** to highlight its importance in modern mobile phone repair.

## UNDERSTANDING IC REBALLING IN MOBILE REPAIR

### What is IC Reballing?

IC reballing is the process of **removing an integrated circuit (IC) from the PCB, replacing the worn-out solder balls, and reinstalling the IC with fresh solder connections**. This process is

mainly used for **BGA (Ball Grid Array) ICs**, which rely on **multiple tiny solder balls** for electrical conductivity.

### Why is Reballing Necessary?

- ✓ Restores broken solder joints that cause intermittent failures.
- ✓ Fixes overheating and power issues due to poor electrical contact.
- ✓ Extends the life of mobile motherboards by repairing instead of replacing ICs.
- ✓ Prevents costly motherboard replacements, making repairs more affordable.

### COMMON ICs THAT REQUIRE REBALLING:

- ✓ **Power Management IC (PMIC)** – Controls battery charging and power distribution.
- ✓ **Baseband IC** – Manages mobile network connectivity.
- ✓ **Touch IC** – Responsible for touchscreen responsiveness.
- ✓ **CPU & GPU IC** – Manages processing and graphics rendering.
- ✓ **Wi-Fi & Bluetooth IC** – Handles wireless communication.

### Example of IC Failure Leading to Reballing:

A **Samsung Galaxy S22 Ultra** developed **random shutdown issues** due to **cracked solder joints on the PMIC**. The technician performed **IC reballing**, successfully restoring normal power operation.

### Essential Tools for IC Reballing

#### 1. Hot Air Rework Station

- ✓ Used to **safely remove and reinstall ICs** by applying **controlled heat**.

- ✓ Recommended brands: **Quick 861DW, JBC JTSE-2A, Hakko FR-301.**

## 2. Solder Stencils & Reballing Jig

- ✓ Used to align new solder balls onto the IC.
- ✓ Ensures uniform solder ball placement.

## 3. Solder Paste & Flux

- ✓ **Solder Paste:** Contains microscopic solder balls to create new connections.
- ✓ **Flux:** Prevents oxidation and improves solder flow.

## 4. Microscope & Magnifying Tools

- ✓ **10x–50x microscope** helps in inspecting **fine solder joints**.
- ✓ Ensures proper alignment of re-balled ICs.

## 5. PCB Cleaning Tools

- ✓ **Isopropyl Alcohol (IPA) & anti-static brushes** to clean old solder residue.

- ◆ **Example of Tool Usage:**

A technician successfully reballed a **Baseband IC** on an **iPhone 11 Pro** using a **precision reballing jig and stencil** to restore network connectivity.

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## Step-by-Step IC Reballing Process

### Step 1: Diagnosing the IC for Reballing

- ✓ Use a **digital multimeter** to check voltage continuity across the IC.

- ✓ Inspect under a **microscope** for cracked or weak solder joints.
- ✓ Identify symptoms like **random shutdowns, no display, or no network**, which indicate IC failure.
  - ◆ **Example:** A **OnePlus 9 Pro** with **no Wi-Fi signal** was diagnosed with a faulty Wi-Fi IC. The technician confirmed the issue by checking **voltage continuity and signal loss**.

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### Step 2: Removing the Faulty IC

- ✓ Apply **flux** around the IC to facilitate removal.
- ✓ Set the **hot air rework station** to **280°C–350°C** (depending on the IC type).
- ✓ Heat the IC evenly for **15–20 seconds** until the solder melts.
- ✓ Carefully lift the IC using **tweezers**.
- ◆ **Example:** A technician removed a **damaged Power IC** on an **iPhone 13 Pro** by heating it evenly and lifting it **without damaging surrounding components**.

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### Step 3: Cleaning the IC and PCB Pads

- ✓ Use a **desoldering wick** to remove old solder from the IC pads.
- ✓ Clean the PCB area with **flux and isopropyl alcohol (IPA)**.
- ✓ Ensure the PCB pads are **smooth and ready for new solder application**.
- ◆ **Example:** After removing a **Baseband IC** from a **Google Pixel 6**, the technician cleaned the **IC and motherboard pads** thoroughly before proceeding with reballing.

## Step 4: Applying New Solder Balls (Reballing Process)

- ✓ Place the IC onto a **reballing stencil**.
  - ✓ Apply **solder paste evenly** over the stencil holes.
  - ✓ Use a **hot air rework station to melt and form new solder balls**.
  - ✓ Inspect under a **microscope** to ensure uniform ball formation.
- ◆ **Example:** A technician reballed a **Touch IC** on an **iPhone XS Max**, ensuring perfect **ball alignment using a stencil and hot air heating**.

## Step 5: Reinstalling the Re-balled IC

- ✓ Align the **reballed IC** onto the cleaned PCB pads.
  - ✓ Apply **flux** to improve adhesion.
  - ✓ Heat the IC using the **hot air rework station** until the solder melts and forms strong connections.
  - ✓ Let it **cool naturally** before testing.
- ◆ **Example:** A **charging IC** on a **Redmi Note 10** was successfully reinstalled, fixing **charging failures** caused by cracked solder joints.

## Step 6: Testing the Repair

- ✓ Use a **multimeter** to check electrical continuity.
  - ✓ Power on the device and test the repaired circuit.
  - ✓ Ensure the phone **functions normally** without issues.
- ◆ **Example:** A technician repaired a **damaged CPU connection** on an **iPhone 12 Pro Max**, verifying the fix through a **post-repair boot test and stress testing**.

## Common Mistakes in IC Reballing & Solutions

- ✗ **Overheating the IC** – Can permanently damage the component.
  - ✓ **Solution:** Use a controlled heat range ( $280^{\circ}\text{C}$ - $350^{\circ}\text{C}$ ).
  
  - ✗ **Misaligned solder balls** – Leads to poor electrical contact.
  - ✓ **Solution:** Use precision stencils and microscopes to ensure perfect alignment.
  
  - ✗ **Not cleaning PCB pads properly** – Can cause short circuits.
  - ✓ **Solution:** Always clean with isopropyl alcohol and flux.
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## CASE STUDY: RESTORING A DEAD iPhone WITH CPU REBALLING

### Problem:

An iPhone 12 Pro Max failed to turn on. Diagnosis revealed a **cold solder joint under the CPU**, disrupting power flow.

### Repair Process:

- ✓ **Step 1:** Used a multimeter to confirm missing voltage on CPU pads.
- ✓ **Step 2:** Removed the CPU using a hot air rework station.
- ✓ **Step 3:** Cleaned the CPU and PCB pads with flux and alcohol.
- ✓ **Step 4:** Re-balled the CPU using a precision stencil and solder paste.
- ✓ **Step 5:** Reinstalled the CPU and tested the repair.
- ✓ **Final Result:** The phone powered on successfully, confirming a successful CPU reballing.

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- ◆ **Key Takeaway:** Reballing allows technicians to repair high-value devices without replacing expensive motherboards.
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## Exercise: Test Your Knowledge

1. What is the purpose of IC reballing?
  2. Why is flux used during reballing?
  3. What is the recommended temperature for removing BGA ICs?
  4. How do you ensure proper alignment of solder balls during reballing?
  5. Why is cleaning the PCB important before reinstalling an IC?
- 

## CONCLUSION

IC reballing is a **critical repair technique** that allows mobile technicians to **restore damaged BGA ICs, fix motherboard failures, and extend the life of smartphones**. With **advanced microsoldering tools and precision alignment methods**, skilled technicians can **repair faulty solder joints and restore device functionality efficiently**.

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# ADVANCED BATTERY REPAIR & CALIBRATION

## INTRODUCTION

A mobile phone's battery is one of the most essential components, providing the necessary power to keep the device running efficiently. However, over time, **batteries degrade due to charging cycles, overheating, software misconfigurations, and physical damage**. Common battery-related issues include **fast draining, charging failure, overheating, and inaccurate percentage readings**.

Advanced battery repair and calibration involve diagnosing battery faults, replacing damaged battery components, and recalibrating the battery to ensure **accurate power readings, optimized performance, and extended battery life**.

In this chapter, we will explore the **structure of mobile batteries, common battery failures, advanced repair techniques, battery calibration methods, and real-world case studies** to provide a comprehensive understanding of mobile battery restoration.

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## UNDERSTANDING MOBILE PHONE BATTERIES

### What is a Mobile Battery?

A mobile phone battery is a **rechargeable energy storage unit** that powers the device. Most modern smartphones use **Lithium-Ion (Li-Ion)** or **Lithium-Polymer (Li-Po)** batteries due to their **high energy density, lightweight nature, and fast charging capabilities**.

### Key Components of a Mobile Battery:

- ✓ **Battery Cell** – Stores and releases energy.
- ✓ **Battery Management System (BMS)** – Controls charging and discharging to prevent overheating.
- ✓ **Protection Circuit Module (PCM)** – Prevents overvoltage, overcurrent, and short circuits.
- ✓ **Battery Connector & Flex Cable** – Transfers power to the motherboard.

### COMMON TYPES OF MOBILE BATTERIES:

- ✓ **Removable Batteries**: Found in older phones, easy to replace.
- ✓ **Non-Removable Batteries**: Built into modern smartphones, requiring professional repair.
- ✓ **Fast-Charging Batteries**: Equipped with **high-wattage charging circuits** for quick energy replenishment.
  - ◆ **Example**: The **Samsung Galaxy S22 Ultra** uses a **5,000mAh Li-Po battery with 45W fast charging**, requiring specialized repair techniques for battery replacements.

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### COMMON BATTERY ISSUES & CAUSES

#### 1. Fast Battery Drain

- ✓ **Cause**: Background apps, high screen brightness, aging battery cells.
- ✓ **Solution**: Close unnecessary apps, lower screen brightness, replace old battery.

#### 2. Phone Not Charging

- ✓ **Cause:** Faulty charging IC, damaged battery connector, dead battery.
- ✓ **Solution:** Check with a **multimeter**, replace faulty components.

### 3. Overheating While Charging

- ✓ **Cause:** Using non-original chargers, excessive power draw, internal short circuits.

- ✓ **Solution:** Use **original chargers**, check for **power IC issues**.

### 4. Inaccurate Battery Percentage

- ✓ **Cause:** Battery miscalibration, corrupted power management data.

- ✓ **Solution:** Perform a **battery recalibration procedure**.

- ◆ **Example:** An **iPhone 13 Pro Max** displayed **erratic battery percentage readings**. The technician recalibrated the battery by **fully discharging and recharging the battery cycle**.

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## ADVANCED BATTERY REPAIR TECHNIQUES

### Step 1: Diagnosing Battery Issues

- ✓ Use a **multimeter** to measure battery voltage and resistance.
- ✓ If voltage is **below 3.7V**, the battery may be dead or deeply discharged.
- ✓ Inspect for **bulging, corrosion, or broken connectors**.

- ◆ **Example:** A **Google Pixel 6** with no power was diagnosed with a **dead battery cell** after voltage testing revealed a reading of **0V**.

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### Step 2: Battery Cell Repair (For Li-Ion & Li-Po Batteries)

- ✓ Open the battery casing carefully **without puncturing the cell**.
  - ✓ Check internal **battery protection circuits** for burn marks.
  - ✓ Replace **damaged PCM (Protection Circuit Module)** if necessary.
  - ✓ Use a **battery spot welder** to attach a new battery cell.
- ◆ **Example:** A technician repaired a **faulty OnePlus 8 Pro battery** by **replacing the damaged PCM module** and restoring battery functionality.

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### Step 3: Repairing a Non-Charging Battery

- ✓ Inspect the **battery flex cable and connector** for damage.
  - ✓ Use a **DC power supply** to **manually boost charge** a deeply discharged battery.
  - ✓ Replace the **charging IC** if the battery fails to charge.
- ◆ **Example:** A **Samsung Galaxy Note 10+** was not charging. A **charging IC replacement and battery flex repair** restored normal charging.

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### Step 4: Replacing a Swollen or Dead Battery

- ✓ If a battery is swollen, it is **dangerous and must be replaced immediately**.
  - ✓ Use **heat pads or suction tools** to remove sealed non-removable batteries.
  - ✓ Install a new **OEM battery** and test its charging efficiency.
- ◆ **Example:** A **Xiaomi Mi 11 Ultra** with a swollen battery was safely removed and replaced with a **genuine OEM battery** to restore normal performance.

## BATTERY CALIBRATION TECHNIQUES

### What is Battery Calibration?

Battery calibration is the process of **resetting a smartphone's battery statistics** to improve **accuracy in power readings**, prevent **sudden shutdowns**, and **extend battery lifespan**.

### When to Calibrate a Battery?

- ✓ If the battery percentage drops suddenly.
- ✓ If the phone shuts down at 20–30% charge.
- ✓ If the battery charges too fast or too slow.

### Step-by-Step Battery Calibration Process:

- ✓ **Step 1:** Charge the phone to **100%** and leave it plugged in for **2 hours**.
  - ✓ **Step 2:** Use the phone until it drains to **0%** and turns off.
  - ✓ **Step 3:** Leave the phone **off** for **3-5 hours**.
  - ✓ **Step 4:** Charge the phone **to 100%** again **without turning it on**.
  - ✓ **Step 5:** Restart the phone and check battery performance.
- ◆ **Example:** A technician successfully recalibrated an **iPhone 12** battery that was shutting down at **30% charge**, fixing the inaccurate battery readings.

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## COMMON MISTAKES IN BATTERY REPAIR & CALIBRATION

- ✗ **Using non-original batteries** – May cause overheating or boot issues.
- ✓ **Solution:** Always use **OEM-approved batteries** for replacements.

✗ **Skipping battery calibration after replacement** – Leads to inaccurate battery readings.

✓ **Solution:** Perform a calibration cycle after every battery replacement.

✗ **Overheating the battery during repairs** – Can damage battery cells.

✓ **Solution:** Use low-heat tools when opening sealed battery compartments.

## CASE STUDY: RESTORING A COMPLETELY DEAD iPhone BATTERY

### Problem:

An iPhone 11 Pro Max was brought to a repair shop with **no power** and **no charging response**.

### Repair Process:

- ✓ **Step 1:** Used a multimeter to check the battery voltage – 0V detected.
  - ✓ **Step 2:** Connected the battery to a DC power supply for manual jump-start charging.
  - ✓ **Step 3:** Once voltage reached 3.7V, reinserted the battery into the phone.
  - ✓ **Step 4:** Performed a battery calibration cycle.
  - ✓ **Final Result:** The phone powered on successfully, with normal charging restored.
- ◆ **Key Takeaway:** Advanced battery repair techniques can revive completely dead batteries, preventing unnecessary replacements.

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## Exercise: Test Your Knowledge

1. What is the function of the Protection Circuit Module (PCM) in a battery?
  2. How can you manually boost charge a deeply discharged battery?
  3. What are the signs that a battery needs calibration?
  4. Why is it important to use an OEM battery replacement?
  5. What is the correct step-by-step battery calibration process?
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## CONCLUSION

Advanced battery repair and calibration techniques are essential for **restoring battery performance, extending lifespan, and preventing power issues in mobile phones**. By diagnosing **battery faults**, performing micro-repairs, replacing **faulty components**, and recalibrating the **battery cycle**, technicians can **repair rather than replace batteries**, reducing costs and enhancing device longevity.

With the growing demand for **fast-charging, high-capacity mobile batteries**, mastering **advanced repair techniques** will be crucial for **mobile repair professionals and engineers** in the future.

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**ASSIGNMENT:**  
**PERFORM A MICROSOLDERING REPAIR TASK  
ON A FAULTY PCB.**  
**SUBMIT A REPORT ON DIFFERENT TYPES OF  
IC FAILURES AND REPAIR TECHNIQUES.**

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## SOLUTION: PERFORM A MICROSOLDERING REPAIR TASK ON A FAULTY PCB – STEP-BY-STEP GUIDE

Microsoldering is a **high-precision repair technique** used to fix **damaged circuit board components, broken tracks, and faulty IC connections** in mobile phones. It requires **specialized tools, steady hands, and technical expertise** to ensure a successful repair without damaging nearby components.

This guide provides a **step-by-step process** to perform a **microsoldering repair on a faulty PCB (Printed Circuit Board)**, covering **diagnostics, preparation, soldering, and post-repair testing**.

### Tools Required for Microsoldering Repair

Before beginning the repair process, gather the necessary tools:

- ✓ **Digital Multimeter** – To test voltage, resistance, and continuity.
- ✓ **Hot Air Rework Station** – For IC and small component removal.
- ✓ **Fine-Tip Microsoldering Iron (15W-35W)** – For precision soldering.
- ✓ **Soldering Paste & Flux** – To improve solder flow and prevent oxidation.
- ✓ **Desoldering Wick & Solder Sucker** – For removing excess solder.
- ✓ **Magnifying Glass or Microscope (10x-50x)** – For inspecting tiny PCB components.
- ✓ **Tweezers & Anti-Static Brush** – For handling small parts safely.
- ✓ **PCB Holder & Anti-Static Mat** – To stabilize the board and prevent ESD (Electrostatic Discharge).
- ✓ **Ultrasonic Cleaner (Optional)** – For deep cleaning water-damaged PCBs.

## STEP-BY-STEP MICROSOLDERING REPAIR PROCESS

### Step 1: Diagnosing the Faulty PCB

- ✓ Inspect the PCB under a **microscope** for **burned areas, broken tracks, loose components, or corrosion**.
- ✓ Use a **digital multimeter** in **continuity mode** to check for **open circuits or shorted components**.
- ✓ Identify the faulty component or track that requires repair.
  - ◆ **Example:** A **Samsung Galaxy S21 Ultra** with **no power** was diagnosed with a **burned power IC** and **broken track near the battery connector**.

---

### Step 2: Preparing the Work Area

- ✓ Place the PCB on a **heat-resistant mat** or **PCB holder** for stability.
- ✓ Wear an **anti-static wrist strap** to prevent electrostatic discharge damage.
- ✓ Clean the affected area using **isopropyl alcohol (IPA)** and a **lint-free brush**.
- ✓ Apply a **small amount of flux** to improve solder adhesion.
  - ◆ **Example:** A technician repairing a **damaged Wi-Fi module** on an **iPhone 12 Pro** cleaned the board thoroughly before applying flux for better soldering results.

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### Step 3: Removing the Faulty Component

- ✓ If replacing a **small component** (**resistor, capacitor, IC**):
  - Apply heat using a **hot air rework station (250°C–350°C)**.

- Use **fine-tip tweezers** to gently lift the component once the solder melts.
- ✓ If repairing a **broken PCB track**:
- Use a **scalpel or fine sandpaper** to expose the copper trace for re-soldering.
- ◆ **Example:** A technician removed a **damaged Touch IC** from an **iPhone XR motherboard** by carefully heating it with a **hot air rework station**.

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#### Step 4: Cleaning & Preparing the Solder Pads

- ✓ Use a **desoldering wick and soldering iron** to remove excess solder.
- ✓ Apply **flux** to clean the area and ensure smooth solder flow.
- ✓ If working with an **IC reinstallation**, clean the **IC pads on the motherboard**.
- ◆ **Example:** A technician repairing a **shorted charging IC** on a **OnePlus 9 Pro** cleaned the PCB pads thoroughly before installing the new component.

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#### Step 5: Installing the New Component or Jumper Wire

##### For Component Replacement:

- ✓ Align the **new component (IC, capacitor, resistor, or diode)** with the cleaned pads.
- ✓ Use a **microsoldering iron (set at 280°C–320°C)** to carefully attach the component.
- ✓ Apply **minimal solder** to avoid short circuits.

## FOR JUMPER WIRE REPAIR (BROKEN TRACK REPAIR):

- ✓ Use **thin copper jumper wire (0.02mm–0.05mm)** to reconnect the broken trace.
- ✓ Solder one end of the wire to the first pad, then the second end to the destination pad.
- ✓ Secure the wire with **UV glue or insulating tape**.
  - ◆ **Example:** A technician successfully restored the **backlight circuit** on an **iPhone 11 Pro Max** by soldering a **jumper wire** to **bypass a broken track**.

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## Step 6: Reassembling and Securing the Repair

- ✓ After soldering, apply **UV glue or conformal coating** to protect exposed tracks.
- ✓ If working with a heat-sensitive IC, allow the board to cool down naturally.
- ✓ Reassemble the phone and check all connections.
  - ◆ **Example:** After repairing a **damaged CPU power line** on a **Google Pixel 6**, the technician secured the **jumper wire** with **UV glue** to prevent future damage.

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## Step 7: Testing the Repair

- ✓ Use a **multimeter** to check voltage and continuity at the repaired area.
- ✓ Reconnect the battery and power on the device.
- ✓ Perform **functional tests** to confirm the repair (e.g., checking network, charging, display).

- ◆ Example: A non-functional volume button circuit on a **Xiaomi Mi 11 Ultra** was tested post-repair using a **multimeter** and a **diagnostic app**.
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## Common Mistakes in Microsoldering & How to Avoid Them

- ✗ **Overheating Components** – Can burn the PCB or damage adjacent parts.  
✓ **Solution:** Use controlled heat settings and avoid prolonged exposure.
  - ✗ **Excess Solder Application** – Can create short circuits.  
✓ **Solution:** Use flux and minimal solder for clean connections.
  - ✗ **Misalignment of Components** – Leads to improper electrical contact.  
✓ **Solution:** Use a microscope to ensure precise alignment before soldering.
  - ✗ **Not Cleaning PCB Before Repair** – Can cause poor solder adhesion.  
✓ **Solution:** Always clean with isopropyl alcohol and an anti-static brush.
- 

## CASE STUDY: FIXING A NO DISPLAY ISSUE DUE TO A DAMAGED PCB TRACK

### Problem:

A **Huawei P40 Pro** was brought in with a **black screen issue**. The technician diagnosed a **broken backlight track** on the **motherboard**.

### Repair Process:

- ✓ **Step 1:** Inspected the **backlight circuit under a microscope** and found a broken track.
  - ✓ **Step 2:** Cleaned the area with **flux and isopropyl alcohol**.
  - ✓ **Step 3:** Soldered a **0.02mm copper jumper wire** to reconnect the circuit.
  - ✓ **Step 4:** Secured the wire with **UV glue**.
  - ✓ **Final Result:** The phone **powered on with a fully working display**.
- ◆ **Key Takeaway:** Jumper wire repair is an effective solution for restoring broken PCB tracks without replacing the entire motherboard.

---

### Exercise: Test Your Knowledge

1. What is the role of flux in microsoldering?
2. Why is a microscope necessary for PCB repairs?
3. What are the common causes of broken PCB tracks?
4. How can you prevent overheating while using a hot air rework station?
5. What is the correct method for soldering a new IC onto a motherboard?

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### CONCLUSION

Microsoldering is an **advanced repair technique** that allows technicians to fix **complex PCB failures, replace tiny components, and restore electrical connections** in mobile phones. By mastering **diagnostics, precision soldering, and post-repair testing**, professionals can **repair faulty PCBs instead of replacing entire**

**motherboards, making repairs more cost-effective and sustainable.**

With the increasing complexity of smartphone hardware, **microsoldering expertise will remain a critical skill for advanced mobile repair technicians.**



## SOLUTION: REPORT ON DIFFERENT TYPES OF IC FAILURES AND REPAIR TECHNIQUES – STEP-BY-STEP GUIDE

Integrated Circuits (ICs) are critical components in mobile phones, responsible for **power distribution, signal processing, connectivity, and device performance**. IC failures can lead to various mobile phone issues such as **no power, charging failures, network loss, or unresponsive touchscreens**. Repairing faulty ICs requires **diagnostics, microsoldering, reballing, and replacement techniques** to restore device functionality.

This guide provides a **step-by-step method** to create a professional report on **different types of IC failures and repair techniques**, ensuring a structured approach to identifying, diagnosing, and repairing faulty ICs.

---

### Step 1: Define the Objective of the Report

The first step in writing a report is to establish its **purpose and scope**. In this case, the report will:

- ✓ Identify different **types of IC failures in mobile phones**.
  - ✓ Explain **diagnostic methods** to detect faulty ICs.
  - ✓ Describe **repair techniques** such as **microsoldering, reballing, and replacement**.
  - ✓ Provide **real-world examples and case studies**.
- 

### Step 2: Structure the Report

A professional report should follow a **logical flow**. Below is a recommended structure:

#### 1. Title Page

- **Report Title:** "Analysis of IC Failures and Repair Techniques in Mobile Phones"
- **Author Name**
- **Date of Submission**

## 2. Table of Contents

- Introduction
- Types of IC Failures
- IC Diagnosis Methods
- IC Repair Techniques
- Case Studies
- Conclusion
- References

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## Step 3: Write the Report

### Introduction

The **introduction** should provide an overview of ICs in mobile phones, their importance, and why IC failures occur.

### Example:

Integrated Circuits (ICs) are essential for managing various mobile phone functions, including **power regulation, processing, and connectivity**. Over time, ICs may fail due to **overheating, electrical surges, moisture exposure, or physical damage**. Identifying and repairing faulty ICs is crucial to restoring a device's functionality without replacing the entire motherboard.

## Types of IC Failures

### 1. Power IC (PMIC) Failures

**Function:** Controls battery charging and distributes power across the motherboard.

#### ✓ Common Symptoms:

- Phone does not turn on.
- Battery drains abnormally fast.
- Overheating issues.

#### ✓ Causes:

- Overheating due to **excessive power draw**.
- Water damage affecting IC circuits.
- Manufacturing defects in solder joints.

#### ✓ Repair Techniques:

- **Microsoldering:** Replacing damaged PMIC.
- **Reballing:** Restoring solder ball connections.
- ◆ **Example:** A Samsung Galaxy S21 Ultra had a damaged PMIC due to water exposure. The technician removed the faulty IC using a hot air rework station and replaced it with a new one.

### 2. Charging IC Failures

**Function:** Regulates voltage input from the charging port to the battery.

#### ✓ Common Symptoms:

- Phone does not charge or charges slowly.
- Overheating while charging.
- Battery percentage jumps erratically.

#### ✓ Causes:

- Use of non-original chargers leading to **voltage spikes**.
- Damaged charging flex or connector.
- Short circuit in the charging circuit.

#### ✓ Repair Techniques:

- **Component-level repair:** Replacing the Charging IC.
- **Jumper wire repair:** Bridging broken charging tracks.
- ◆ **Example:** An iPhone 12 Pro was not charging due to a damaged charging IC. The technician used a multimeter to test voltage, confirmed the failure, and replaced the IC using microsoldering techniques.

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### 3. Baseband IC Failures

**Function:** Controls network connectivity (2G, 3G, 4G, 5G).

#### ✓ Common Symptoms:

- No signal or weak network reception.
- SIM card not detected.
- “Searching” or “No Service” issue.

#### ✓ Causes:

- Corrupt firmware or software bugs.

- Poor soldering leading to **cold solder joints**.
- Water or physical damage affecting network components.

#### ✓ Repair Techniques:

- **Reballing the IC** to restore connectivity.
  - **Replacing the Baseband IC** if completely damaged.
- ◆ **Example:** A Google Pixel 6 had a **No Network issue**. The Baseband IC was **reballied and resoldered** to restore connectivity.

---

## 4. Touch IC Failures

**Function:** Manages touchscreen inputs and responsiveness.

#### ✓ Common Symptoms:

- Unresponsive touch screen.
- Ghost touch issues (screen operates on its own).
- Partial screen touch failure.

#### ✓ Causes:

- Overheating due to **intensive GPU tasks**.
- Manufacturing defects in **iPhone Touch IC solder joints**.
- Accidental drops leading to **PCB damage**.

#### ✓ Repair Techniques:

- **Reflowing the Touch IC** using a hot air rework station.
- **Replacing the IC** using microsoldering.

- ◆ **Example:** An iPhone 11 Pro Max had a **touch failure** due to a cracked **Touch IC solder joint**. The technician **reballied the IC and reinstalled it**, restoring touchscreen functionality.
- 

## IC Diagnosis Methods

### 1. Visual Inspection

- ✓ Use a **microscope** to check for **burned areas, corrosion, or cracked solder joints**.

### 2. Digital Multimeter Testing

- ✓ Use **voltage and continuity mode** to check for short circuits or missing power flow.

### 3. DC Power Supply Testing

- ✓ Connect a **DC power supply** to measure the motherboard's **current draw**.

- ◆ **Example:** A technician found an **abnormal current draw** in an iPhone 12 using a **DC power supply**, indicating a **shorted Power IC**.
- 

## IC Repair Techniques

### 1. Microsoldering Replacement

- ✓ Used to **remove and replace faulty ICs** with precision.

### 2. IC Reballing Process

- ✓ Used when **solder ball connections are weak or broken**.

### 3. Jumper Wire Repair

- ✓ Used to **bridge broken PCB tracks** leading to an IC.

---

## CASE STUDY: REPAIRING A NO POWER ISSUE DUE TO A FAULTY PMIC

### Problem:

An **iPhone 13 Pro Max** did not turn on after overheating.

### Diagnosis:

- ✓ Tested battery voltage – found normal.
- ✓ Used a **multimeter** to check **PMIC voltage output** – found missing voltage.

### Repair Process:

- ✓ Removed the **damaged PMIC** using a hot air rework station.
  - ✓ Cleaned PCB pads with **flux and desoldering wick**.
  - ✓ Installed a **new PMIC** using **microsoldering techniques**.
  - ✓ Powered on the phone – successfully restored.
- ◆ **Key Takeaway:** Replacing a faulty PMIC restored power without replacing the motherboard.
- 

### Step 4: Proofread & Format the Report

- ✓ Check for **spelling and grammar mistakes**.
  - ✓ Use **diagrams and images** for clarity.
  - ✓ Format the report in a **PDF or Word Document**.
- 

### Step 5: Submit the Final Report

- ✓ Submit the report **electronically or as a hard copy** to the instructor or supervisor.
-

## CONCLUSION

IC failures in mobile phones can **cause severe functional issues**, but with proper **diagnostics and repair techniques**, technicians can **restore functionality without replacing the motherboard**.

**Microsoldering, reballing, and jumper wire repair** are essential skills for **advanced IC repairs**, reducing repair costs and extending device lifespan.

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