



**Independent
Skill Development
Mission**



ISDM (INDEPENDENT SKILL DEVELOPMENT MISSION)

UNDERSTANDING SOLDERING TECHNIQUES FOR CHIP-LEVEL REPAIRS

INTRODUCTION TO SOLDERING IN MOBILE REPAIR

Soldering is an essential skill in **chip-level mobile repairing**, allowing technicians to **connect, repair, or replace electronic components** on a mobile phone's **Printed Circuit Board (PCB)**. Chip-level repairs involve working with **small integrated circuits (ICs), resistors, capacitors, and microchips**, requiring precision and expertise.

✓ Why is soldering important?

- Used to **repair broken connections on a PCB**.
- Helps in **removing and replacing faulty components**.
- Essential for **fixing short circuits and restoring power flow**.
- Required in **micro-soldering to repair tiny chip components**.

Example:

A technician needs to replace a **faulty charging IC on a smartphone motherboard**. Using **hot air rework and micro-soldering**, they successfully install a new IC, restoring the phone's charging function.

Types of Soldering Techniques Used in Chip-Level Repair

Hand Soldering (Basic Soldering)

What is Hand Soldering?

Hand soldering is a **manual soldering technique** using a **soldering iron** to connect or replace small electronic components. It is used for:

- ✓ Fixing broken connections on a circuit board.
- ✓ Soldering through-hole and surface-mount components.
- ✓ Joining wires or repairing minor circuit board damages.

STEP-BY-STEP GUIDE: HAND SOLDERING

- ✓ **Step 1:** Heat the **soldering iron** to **350°C - 400°C**.
- ✓ **Step 2:** Apply **flux** to the joint for better solder flow.
- ✓ **Step 3:** Place the **solder wire on the joint** and apply heat.
- ✓ **Step 4:** Allow the solder to melt and form a strong bond.
- ✓ **Step 5:** Let it cool, then inspect for proper soldering.

✓ Common Issues in Hand Soldering:

Issue	Cause	Solution
Solder does not stick	Dirty or oxidized surface	Clean with isopropyl alcohol
Excessive solder forms a blob	Too much solder applied	Use a desoldering pump to remove excess
Cold solder joint	Not enough heat applied	Increase the temperature and reflow the joint

HOT AIR SOLDERING (REWORK SOLDERING)

What is Hot Air Soldering?

Hot air soldering is used to **remove and replace Surface-Mount Devices (SMDs) or ICs** without damaging nearby components. It uses a **hot air rework station** instead of a soldering iron.

- ✓ Best for **replacing IC chips, connectors, and small SMD components**.
- ✓ Uses **controlled heat** to remove and reattach chips without applying direct soldering iron contact.

STEP-BY-STEP GUIDE: HOT AIR SOLDERING

- ✓ **Step 1:** Set the **hot air station to 350°C - 400°C**.
- ✓ **Step 2:** Apply **flux** around the component to be removed.
- ✓ **Step 3:** Use **hot air flow to heat the solder joints** until the component loosens.
- ✓ **Step 4:** Remove the component using **tweezers**.
- ✓ **Step 5:** Place the new component and reheat until the solder melts and bonds it.

✓ Common Issues in Hot Air Soldering:

Issue	Cause	Solution
Overheating damages PCB	Excessive heat or prolonged exposure	Use the correct temperature and time
IC shifts from position	Airflow too strong	Adjust airflow to a lower setting

Solder balls form under the IC	Flux contamination or improper heating	Clean PCB and reheat carefully
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Micro-Soldering (Advanced Soldering)

What is Micro-Soldering?

Micro-soldering is a **precision-based technique** used for **chip-level motherboard repairs**. It involves working with **small components** such as:

- ✓ Power ICs (PMICs)
- ✓ Audio ICs
- ✓ Charging ICs
- ✓ Display connectors

STEP-BY-STEP GUIDE: MICRO-SOLDERING

- ✓ **Step 1:** Use a **microscope** to magnify the component.
- ✓ **Step 2:** Apply **flux and heat** with a **fine-tip soldering iron**.
- ✓ **Step 3:** Use **0.2mm solder wire** to attach or reattach micro components.
- ✓ **Step 4:** Test the board using a **multimeter** to check for proper connections.

✓ Common Issues in Micro-Soldering:

Issue	Cause	Solution
Bridges form between pins	Excess solder	Use solder wick to remove excess

IC not connecting properly	Dry solder joints	Reflow with additional flux
Board damage from heat	High-temperature exposure	Use precise heat settings

Soldering Tools and Equipment for Chip-Level Repair

Essential Soldering Tools

- ✓ **Soldering Iron** – For hand soldering small components.
- ✓ **Hot Air Rework Station** – For removing and replacing ICs.
- ✓ **Flux (Liquid or Paste)** – Improves solder flow.
- ✓ **Solder Wick & Desoldering Pump** – Removes excess solder.
- ✓ **Fine-Tip Tweezers** – Handles small components.
- ✓ **Multimeter** – Checks for proper solder connections.
- ✓ **Microscope** – Assists in micro-soldering repairs.

Example:

A technician replaces a **faulty audio IC** using a **hot air rework station and microscope** to align the small pins correctly.

CASE STUDY: REPAIRING A DAMAGED CHARGING PORT WITH SOLDERING

Scenario:

A customer's smartphone **stops charging**, and upon inspection, the technician finds **broken solder joints on the charging port**.

Solution:

- ✓ **Step 1:** The technician **removes the damaged charging port using hot air soldering.**
 - ✓ **Step 2:** Cleans the area with **isopropyl alcohol and applies flux.**
 - ✓ **Step 3:** Installs a **new charging port and micro-solders the connections.**
 - ✓ **Step 4:** Uses a **multimeter to test continuity,** ensuring a successful repair.
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Exercise

1. **What are the key differences between hand soldering and micro-soldering?**
 2. **Why is flux important in soldering?**
 3. **Explain the risks of excessive heat when working with IC chips.**
 4. **What precautions should be taken while using a hot air rework station?**
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CONCLUSION

Soldering techniques are essential for **chip-level mobile repairs,** allowing technicians to **replace faulty components, repair damaged PCBs, and restore device functionality.**

- ✓ **Hand soldering** is used for **basic connections and wire repairs.**
- ✓ **Hot air soldering** is ideal for **replacing SMD and IC chips.**
- ✓ **Micro-soldering** is necessary for **precision repairs on smartphone motherboards.**

WORKING WITH SMD COMPONENTS

INTRODUCTION TO SURFACE-MOUNT DEVICES (SMDs)

What Are SMD Components?

Surface-Mount Devices (SMDs) are **small electronic components** mounted directly onto a **Printed Circuit Board (PCB)** using a process called **Surface-Mount Technology (SMT)**. Unlike traditional **through-hole components**, SMDs do not require leads that pass through holes in the PCB.

✓ Why are SMDs used?

- **Smaller size and lightweight** – Ideal for compact mobile devices.
- **Improved performance** – Shorter electrical paths reduce resistance and enhance speed.
- **Automated assembly** – SMD components are easier to place on PCBs using robotic systems.

✓ Common SMD Components in Mobile Phones

- **Resistors** – Control current flow.
- **Capacitors** – Store and release electrical energy.
- **Diodes** – Allow current to flow in one direction only.
- **Transistors** – Act as switches or amplifiers.
- **Integrated Circuits (ICs)** – Handle complex operations like power management and signal processing.

TYPES OF SMD COMPONENTS IN MOBILE PHONE REPAIR

SMD Resistors and Capacitors

Understanding SMD Resistors

SMD resistors **regulate voltage and limit current** in circuits. They are identified by **three- or four-digit codes** printed on their surface.

✓ **Example of Resistor Code:** A resistor marked "**103**" means $10 \times 10^3 = 10,000\Omega$ (10k Ω).

✓ **Common Issues with SMD Resistors:**

Issue	Cause	Solution
Open circuit	Resistor is broken or cracked	Replace with the correct value resistor
Incorrect resistance	Manufacturing defect or overheating	Check with a multimeter and replace if needed
Burnt resistor	Short circuit or excessive current	Identify the fault and replace the component

Understanding SMD Capacitors

SMD capacitors **store and release electrical energy**, playing a crucial role in **power management, filtering, and signal processing**.

✓ **Common Types:**

- **Ceramic Capacitors** – Used in power supply sections.
- **Tantalum Capacitors** – Used in high-frequency circuits.

✓ Example Issue:

A faulty **power capacitor** can cause **no power or random shutdown issues** in a smartphone.

✓ Solution:

Check with a **multimeter**, desolder the faulty capacitor, and replace it with a matching one.

SMD Diodes and Transistors

Understanding SMD Diodes

Diodes allow **current to flow in one direction** only. They are used for **voltage protection and rectification** in mobile devices.

✓ Common Diode Issues:

- **Shorted diode** → Causes excessive heating and power drain.
- **Open diode** → Prevents proper current flow, causing power issues.

✓ Solution:

Use a **diode mode test on a multimeter** to check for short circuits and replace faulty diodes.

Understanding SMD Transistors

SMD transistors act as **switches and amplifiers**. In mobile devices, they are found in **power circuits, audio systems, and signal amplifiers**.

✓ Common Transistor Issues:

- **Faulty power transistor** → Causes **no display or no power** in phones.

- **Damaged switching transistor** → Causes **charging issues or touch screen malfunctions**.

✓ **Solution:**

Check the transistor using a **multimeter in diode mode**, and replace it if faulty.

SMD Integrated Circuits (ICs) in Mobile Phones

Understanding SMD ICs

Integrated Circuits (ICs) are the **brains of electronic circuits**, performing complex operations like **power management, signal processing, and data storage**.

✓ **Types of ICs in Mobile Phones:**

- **Power Management IC (PMIC)** – Controls battery charging and voltage regulation.
- **CPU and RAM ICs** – Process data and execute commands.
- **Audio ICs** – Control sound processing.

✓ **Common IC Problems:**

Issue	Cause	Solution
No power in phone	Faulty PMIC	Reflow or replace the IC
No sound from speaker	Damaged Audio IC	Replace the IC
Device overheating	CPU overheating	Check heat dissipation and replace thermal paste

✓ Example:

A phone with **no charging response** might have a **faulty Charging IC**. Replacing the IC restores normal charging function.

SMD Soldering Techniques and Tools

Essential Tools for Working with SMD Components

- ✓ **Hot Air Rework Station** – For removing and replacing SMD components.
 - ✓ **Soldering Iron with Fine Tip** – For precise soldering of small components.
 - ✓ **Solder Paste and Flux** – Improve soldering connections and prevent oxidation.
 - ✓ **Tweezers and PCB Holder** – For holding tiny SMD components in place.
 - ✓ **Multimeter** – To test resistance, capacitance, and continuity.
 - ✓ **Microscope or Magnifier** – For detailed soldering work on micro components.
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STEP-BY-STEP GUIDE: REPLACING AN SMD COMPONENT

- ✓ **Step 1:** Identify the faulty SMD component using a **multimeter**.
- ✓ **Step 2:** Apply **flux** to the component to ensure a smooth soldering process.
- ✓ **Step 3:** Use a **hot air station** (350-400°C) to heat and remove the faulty component.
- ✓ **Step 4:** Clean the area with **isopropyl alcohol** and apply fresh solder paste.
- ✓ **Step 5:** Place the new component using tweezers and heat it until

it bonds with the PCB.

✓ **Step 6:** Test the repair using a **multimeter** and **power supply** before reassembling the device.

✓ **Common Mistakes in SMD Soldering:**

- **Overheating the PCB** → Can cause board damage or component failure.
- **Misalignment of components** → Leads to short circuits and malfunctioning circuits.
- **Using excess solder** → Can create solder bridges and short components.

CASE STUDY: REPLACING A FAULTY POWER IC IN A SMARTPHONE

Scenario:

A smartphone **does not turn on**, and after testing with a **multimeter**, the technician finds that the **Power Management IC (PMIC)** is faulty.

Solution:

- ✓ **Step 1:** The technician **removes the faulty PMIC** using hot air rework.
- ✓ **Step 2:** Cleans the PCB and applies **new solder paste**.
- ✓ **Step 3:** Places a **new PMIC** in the **correct position** and reheats to secure it.
- ✓ **Step 4:** Uses a **multimeter** to check for proper voltage flow.
- ✓ **Step 5:** Assembles the phone and **verifies that it turns on normally**.

Exercise

1. Why are SMD components preferred over through-hole components in mobile devices?
 2. What is the role of a power management IC in a smartphone?
 3. Describe the steps involved in replacing an SMD capacitor.
 4. What are the key precautions to take when soldering SMD components?
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CONCLUSION

Working with **SMD components** requires precision, the right tools, and a deep understanding of **electronic circuits**. **Technicians must master the use of hot air soldering, micro-soldering, and multimeter testing** to repair mobile phones effectively.

- ✓ **SMD resistors, capacitors, diodes, transistors, and ICs** play critical roles in mobile phone functioning.
- ✓ **Proper soldering techniques** prevent board damage and ensure reliable repairs.
- ✓ **Using advanced tools** like a hot air rework station and microscope improves repair accuracy.

DIAGNOSING AND FIXING MOTHERBOARD SHORT CIRCUITS

INTRODUCTION TO MOTHERBOARD SHORT CIRCUITS

What is a Short Circuit in a Mobile Motherboard?

A short circuit occurs when **electricity flows through an unintended path**, causing excessive current and potentially damaging the **components of a mobile phone motherboard**. It happens when two or more electrical connections that are not supposed to touch each other make contact, leading to **device failure, overheating, or complete shutdown**.

✓ Why Do Short Circuits Occur?

- **Water Damage** – Moisture corrodes circuit pathways, causing unintended connections.
- **Faulty Components** – Damaged **capacitors, resistors, or ICs** can lead to short circuits.
- **Improper Repairs** – Incorrect soldering or misalignment of components can cause shorts.
- **Power Surges** – Excessive voltage can burn out components and create unwanted connections.

✓ Common Symptoms of a Motherboard Short Circuit

- Phone does not power on.
- Excessive heat near a component or IC.
- Battery drains unusually fast.
- Phone restarts frequently or gets stuck in boot loop.

- **Charging issues or no display.**

Example:

A phone that **does not turn on after charging overnight** may have a short circuit in the **charging section or power IC**, caused by a power surge or faulty charging port.

DIAGNOSING SHORT CIRCUITS ON A MOBILE MOTHERBOARD

Step 1: Visually Inspect the Motherboard

Checking for Physical Damage

✓ Remove the phone's **back panel and motherboard shield** to check for:

- **Burnt components or black marks** on the PCB.
- **Swollen or damaged capacitors and resistors.**
- **Loose solder joints or disconnected circuit lines.**

✓ Use a **magnifying glass or microscope** to inspect tiny SMD components for cracks or corrosion.

Step 2: Using a Multimeter to Detect Short Circuits

Setting Up the Multimeter

- ✓ **Set the multimeter to continuity mode (buzzer mode).**
- ✓ Place the **black probe on the ground (GND)** and red probe on **test points.**
- ✓ If the multimeter **beeps continuously**, it indicates a short circuit.

✓ Checking Key Components:

Component	Expected Multimeter Reading	Indication of a Short
Capacitor	One side = Continuity, Other side = No Continuity	Both sides showing continuity (shorted capacitor)
Resistor	Resistance matches the marked value	Resistance = 0Ω (shorted resistor)
IC (Integrated Circuit)	Only VCC and GND should have continuity	Multiple pins showing continuity

✓ Testing the Charging Port for Shorts:

1. Place the multimeter probes on the VBUS and GND pins.
2. If the multimeter **beeps**, the charging circuit is shorted.
3. Remove the charging IC and test again.

Step 3: Checking for Overheating Components

✓ If the **phone turns on but overheats quickly**, a component may be **shorted and drawing too much current**.

✓ Use a **thermal camera or heat detection spray** to identify overheating areas.

✓ If a capacitor or IC gets **too hot to touch**, it may be faulty and needs replacement.

Example:

A technician finds that the **power IC is overheating** immediately after turning on the phone, indicating a **short circuit inside the IC**.

FIXING MOTHERBOARD SHORT CIRCUITS

Step 1: Removing the Faulty Component

✓ Identifying the Component:

- If a **capacitor is shorted**, remove it and check if the short disappears.
- If a **resistor is burnt**, replace it with a new one of the same value.
- If an **IC is shorted**, desolder it and replace it with a new one.

✓ Using a Hot Air Rework Station:

- Apply **flux** to the faulty component.
- Heat the area with a **hot air blower (350-400°C)** until the solder melts.
- Remove the component with **fine-tip tweezers**.

✓ Testing After Removal:

- Check the motherboard again with a **multimeter** to confirm the short is gone.
- If the board no longer beeps in continuity mode, the faulty component was successfully removed.

Step 2: Replacing and Resoldering Components

✓ Installing a New Component:

- Use **solder paste** and place the new component in position.
- Heat it with **hot air** until it bonds to the board.
- Ensure the **polarity is correct for capacitors and diodes**.

✓ Final Testing:

- Reassemble the phone and **power it on**.
- Check if the **phone functions properly without overheating**.

Step 3: Repairing a Burnt PCB Track (If Needed)

✓ If a circuit track is burnt due to a short circuit:

- **Scrape off the burnt track** with a sharp tool.
- Use **jumper wire and solder** to reconnect the broken circuit.
- Apply **insulating tape or epoxy** to secure the connection.

CASE STUDY: REPAIRING A SHORT CIRCUIT IN THE POWER SECTION

Scenario:

A technician receives a smartphone that **does not turn on** after the user **plugged in an incompatible charger**. The phone shows **no response, even when connected to a power source**.

Diagnosis:

✓ **Step 1:** The technician **checks the charging port** with a **multimeter** and finds a **short circuit between the VBUS and GND pins**.

✓ **Step 2: Visual inspection** reveals a **burnt capacitor** near the **power IC**.

✓ **Step 3:** The capacitor is removed using a **hot air rework station**.

✓ **Step 4:** After removing the capacitor, the short circuit is gone, and the phone powers on successfully.

Discussion Questions:

1. How did the technician determine that the capacitor was faulty?
2. What tools were used to remove and replace the damaged component?
3. What would be the next step if the phone still did not turn on after removing the capacitor?

Exercise

1. What are the common causes of short circuits in mobile motherboards?
2. How does a multimeter help in diagnosing short circuits?
3. What precautions should be taken while removing and replacing a faulty SMD component?
4. Why is it important to test the motherboard after replacing a component?

CONCLUSION

Diagnosing and fixing short circuits on a mobile phone motherboard requires **technical expertise, the right tools, and precision soldering skills.**

✓ **Visual inspection and multimeter testing** are the first steps in identifying the issue.

✓ **Faulty capacitors, resistors, or ICs** are common causes of short circuits.

✓ **Using a hot air rework station and proper soldering techniques,** technicians can remove and replace damaged components safely.

✓ **Testing after repair ensures the device functions properly without further risks.**

POWER IC AND CPU TROUBLESHOOTING

INTRODUCTION TO POWER IC AND CPU IN MOBILE PHONES

What Are Power IC and CPU in a Mobile Phone?

The **Power IC (Power Management Integrated Circuit - PMIC)** and **CPU (Central Processing Unit)** are the two most critical components in a mobile phone's motherboard. They control the **power distribution, performance, and processing of the device.**

✓ Power IC (PMIC) Functionality:

- Manages **power supply** to all other components.
- Controls **battery charging and voltage regulation.**
- Protects against **overvoltage, overcurrent, and short circuits.**

✓ CPU Functionality:

- Acts as the **brain of the phone**, processing all commands.
- Handles **operating system tasks, applications, and background processes.**
- Communicates with **RAM, storage, GPU, and other system components.**

If either the **Power IC or CPU fails**, the phone may **not turn on, overheat, reboot randomly, or experience performance issues.**

Example:

A smartphone suddenly **turns off and does not respond to charging.** A technician diagnoses the **Power IC** and finds it faulty. After replacing it, the phone powers on normally.

DIAGNOSING POWER IC ISSUES

Common Symptoms of a Faulty Power IC

- ✓ Phone is completely dead (No power on).
- ✓ Phone restarts randomly or shuts down unexpectedly.
- ✓ Overheating near the Power IC area.
- ✓ Phone does not charge or drains battery abnormally fast.
- ✓ Short circuit detected in the power section (checked via a multimeter).

Step 1: Visual Inspection of the Power IC

✓ Remove the motherboard shield and inspect the Power IC area for:

- Burnt marks or corrosion (water damage).
- Cracked or swollen IC due to overheating.
- Loose solder joints or misalignment.

✓ If the IC appears damaged, it needs to be replaced.

Step 2: Testing Power IC Using a Multimeter

- ✓ Set the multimeter to continuity mode (buzzer mode).
- ✓ Place the black probe on the ground (GND) and red probe on the power lines.
- ✓ Expected readings for Power IC components:

Test Point	Expected Reading	Indication of a Fault
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Power IC input voltage	3.7V - 4.2V (From Battery)	0V = No power reaching IC
Output voltage to CPU	1.8V, 2.5V, 3.3V (Depends on phone model)	0V or unstable voltage = Faulty IC
Short Circuit Test	No continuity	Continuity = Short circuit detected

✓ If there is **no output voltage** from the Power IC, it needs to be replaced.

Step 3: Replacing a Faulty Power IC

- ✓ **Step 1:** Apply **flux** around the IC for smooth removal.
- ✓ **Step 2:** Use a **hot air rework station (350-400°C)** to heat the IC.
- ✓ **Step 3:** Gently lift the IC with **tweezers** once the solder melts.
- ✓ **Step 4:** Clean the **PCB pads** using isopropyl alcohol.
- ✓ **Step 5:** Apply fresh **solder paste** and **install a new Power IC**.
- ✓ **Step 6:** Reassemble the phone and test if it powers on.

Example:

A technician finds that a phone is **not turning on and getting hot near the Power IC**. They replace the **PMIC** using **hot air soldering**, and the phone starts working again.

DIAGNOSING CPU ISSUES

Common Symptoms of a Faulty CPU

- ✓ Phone stuck on boot logo (Boot loop issue).
 - ✓ Phone restarts continuously after a few minutes.
 - ✓ Extreme overheating near the CPU.
 - ✓ Phone does not detect SIM card, network, or storage.
 - ✓ No display even when the phone is powered on.
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Step 1: Checking for Overheating CPU

✓ If the phone overheats immediately after powering on, the CPU might be:

- Overloaded with background processes.
- Short-circuited internally.
- Damaged due to poor heat dissipation.

✓ Use a thermal camera or heat detection spray to locate overheating areas.

✓ If the CPU reaches high temperatures within seconds, it may be faulty.

Step 2: Testing CPU with a Multimeter

✓ Set the multimeter to continuity mode.

✓ Place the black probe on the ground (GND) and red probe on CPU power lines.

✓ If the multimeter beeps continuously, there is a short circuit inside the CPU.

✓ Check the CPU voltage lines:

Voltage Line	Expected Reading	Fault Indication
CPU VCC (Main power)	1.2V - 1.8V	0V = CPU not receiving power
RAM voltage	1.35V - 1.8V	0V = RAM issue (can cause boot loop)
Clock signal	Oscillating voltage	No signal = Faulty CPU

✓ If CPU voltage is 0V, check the Power IC first before assuming CPU failure.

Step 3: Fixing CPU Issues

✓ Reflowing the CPU (If Mildly Faulty)

- Apply flux around the CPU.
- Heat the CPU using a hot air rework station (280-350°C).
- Let it cool and restart the phone.

✓ Replacing the CPU (If Fully Damaged)

- Use a BGA rework station to remove the CPU.
- Install a new CPU and reball the solder balls using reballing paste.
- Check for proper voltage supply after replacement.

✓ Flashing Firmware (If CPU is functional but not booting)

- If the CPU is **not physically damaged**, try **flashing stock firmware** using:
 - **SP Flash Tool (MediaTek devices)**
 - **Odin (Samsung devices)**
 - **Mi Flash Tool (Xiaomi devices)**

Example:

A technician finds that a **phone is stuck on the boot logo and overheats**. Instead of replacing the CPU immediately, they first **reflash the firmware**. The phone **starts working normally**, confirming it was a software issue.

CASE STUDY: TROUBLESHOOTING A DEAD PHONE (POWER IC VS. CPU ISSUE)**Scenario:**

A technician receives a phone that **does not turn on or charge**. The customer says the phone **was working fine until it suddenly shut down**.

Diagnosis:

✓ **Step 1:** The technician **checks the Power IC with a multimeter** and finds **0V output**.

✓ **Step 2:** Replaces the Power IC, but the phone still does not power on.

✓ **Step 3:** The CPU **heats up abnormally within seconds**, indicating an internal short.

✓ **Step 4:** The technician **attempts to reflow the CPU**, but the problem persists.

✓ **Step 5:** CPU is replaced using a **BGA rework station**, and the phone starts working again.

Exercise

1. What are the key differences between Power IC failure and CPU failure?
 2. Why is a multimeter essential for diagnosing motherboard issues?
 3. Describe the step-by-step process of replacing a Power IC.
 4. What precautions should be taken when using a hot air rework station on a CPU?
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CONCLUSION

Troubleshooting **Power IC and CPU issues** requires expertise in **diagnosing faults, using multimeters, and performing chip-level repairs.**

✓ **The Power IC controls power distribution, and its failure results in a dead phone or charging issues.**

✓ **The CPU handles processing, and its failure leads to boot loops, overheating, or complete shutdown.**

✓ **Reflowing, replacing, or reprogramming firmware can fix these issues if diagnosed correctly.**

USING OSCILLOSCOPE & MICROSCOPE FOR CHIP-LEVEL REPAIR

INTRODUCTION TO CHIP-LEVEL REPAIR WITH OSCILLOSCOPE & MICROSCOPE

Chip-level repair is an advanced **mobile phone repair technique** that involves diagnosing and fixing **faulty components on the motherboard**. To perform chip-level repairs effectively, technicians rely on specialized tools like **oscilloscopes and microscopes**.

✓ Why Are These Tools Important?

- **Oscilloscopes** help in measuring and analyzing **voltage signals, frequency, and waveform distortions** in circuits.
- **Microscopes** allow technicians to **inspect small components like ICs, resistors, capacitors, and traces** on the motherboard.

✓ Common Applications in Mobile Repair:

- **Detecting power fluctuations** using an oscilloscope.
- **Identifying broken or shorted components** with a microscope.
- **Soldering and replacing tiny SMD (Surface Mount Device) components**.
- **Verifying the integrity of CPU, Power IC, and other chips**.

Example:

A mobile phone **suddenly stops working**, and a technician suspects a **damaged power IC**. Using a **microscope**, they find a **burnt solder joint**. After replacing the IC, the phone powers on successfully.

USING AN OSCILLOSCOPE FOR MOBILE PHONE REPAIR

Understanding an Oscilloscope and Its Functions

What is an Oscilloscope?

An oscilloscope is an electronic test instrument used to **visualize electrical signals as waveforms on a screen**. It helps technicians analyze circuit behavior in real time.

✓ Functions of an Oscilloscope in Mobile Repair:

- Measures voltage and current waveforms.
- Detects power fluctuations in ICs and processors.
- Identifies noise and distortion in circuits.
- Tests signals from charging ICs, PMICs, and CPU lines.

✓ Key Oscilloscope Terms:

Term	Definition
Waveform	A graphical representation of a signal's voltage over time
Frequency (Hz)	The number of cycles per second in a waveform
Amplitude (V)	The height of the waveform, indicating voltage levels
Triggering	Stabilizes a waveform to make it readable
Probe	A device connected to the oscilloscope for testing signals

STEP-BY-STEP GUIDE: USING AN OSCILLOSCOPE TO DIAGNOSE POWER ISSUES

✓ Step 1: Power On the Oscilloscope

- Set the **voltage and time scale** according to the circuit under test.
- Connect the oscilloscope to **ground and test points** using probes.

✓ Step 2: Identify the Testing Point

- Locate **important voltage lines (VCC, battery terminals, charging IC output, CPU power lines)**.
- Connect the oscilloscope probe to these points to measure the waveform.

✓ Step 3: Analyze the Waveform

- Compare the measured signal to a **reference waveform from a working board**.
- If the waveform is **flat, distorted, or absent**, it indicates a **faulty component or circuit**.

✓ Step 4: Diagnose and Fix the Issue

- If the **charging line shows unstable voltage**, check the **charging IC and battery connector**.
- If the **CPU clock signal is missing**, check the **clock crystal and CPU power line**.

✓ Step 5: Replace Faulty Components

- If the problem is in **ICs or capacitors**, remove and replace them using hot air soldering.
- Re-test the circuit after replacing components.

✓ Example:

A technician tests a **non-charging phone** with an oscilloscope and finds that the **charging IC output voltage is too low**. They replace the **charging IC**, and the phone starts charging again.

USING A MICROSCOPE FOR MOBILE PHONE REPAIR

Understanding a Microscope and Its Functions

What is a Microscope in Mobile Repair?

A microscope is an optical tool used to **magnify small electronic components** on a motherboard. It is essential for inspecting **tiny components, cracked solder joints, and broken PCB traces**.

✓ Functions of a Microscope in Mobile Repair:

- Helps identify short circuits, cracks, and missing components.
- Used for micro-soldering and BGA rework.
- Assists in detecting corrosion and liquid damage on a PCB.
- Helps in alignment of CPU, PMIC, and other chip replacements.

✓ Types of Microscopes Used in Mobile Repair:

Type	Usage
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Stereo Microscope	Used for inspecting and soldering small components
Digital Microscope	Provides high-resolution magnification on a screen
USB Microscope	Portable option for small-scale diagnostics

Step-by-Step Guide: Using a Microscope to Inspect and Repair a Motherboard

✓ Step 1: Position the Motherboard Under the Microscope

- Adjust the **focus and zoom** to get a clear image of the components.

✓ Step 2: Inspect for Physical Damage

- Look for **broken PCB traces, burnt components, missing resistors, or cracked solder joints**.

✓ Step 3: Identify Corrosion or Liquid Damage

- If water damage is suspected, check for **oxidation and rust on IC pins and connectors**.

✓ Step 4: Repairing the Faulty Component

- Use **soldering iron or hot air rework** to replace damaged parts.
- Apply **flux and solder** to fix broken connections.

✓ Step 5: Test the Board After Repair

- After replacing a component, test for **continuity using a multimeter**.
- Power on the board and observe whether the issue is resolved.

✓ Example:

A technician inspects a **dead phone motherboard** under a **microscope** and finds that a **tiny capacitor is missing from the power section**. They replace it, and the phone turns on successfully.

CASE STUDY: REPAIRING A SHORT CIRCUIT USING AN OSCILLOSCOPE AND MICROSCOPE

Scenario:

A customer's smartphone **overheats and shuts down frequently**. The technician suspects a **short circuit in the power section**.

Diagnosis:

- ✓ **Step 1:** The technician **inspects the motherboard under a microscope** and finds a **burnt capacitor near the PMIC**.
- ✓ **Step 2:** Using an **oscilloscope**, they check the power output and find **unstable voltage signals**.
- ✓ **Step 3:** The faulty capacitor is removed and replaced using a **hot air rework station**.
- ✓ **Step 4:** The phone is powered on and tested again, showing **normal voltage readings and no overheating**.

Exercise

1. **Why is an oscilloscope useful in diagnosing charging IC problems?**

2. **How does a microscope help in identifying PCB damage?**
 3. **What are the differences between a stereo microscope and a digital microscope?**
 4. **Describe a situation where an oscilloscope and microscope are both required for mobile repair.**
-

CONCLUSION

Using **oscilloscopes and microscopes** is essential in **chip-level mobile repair**, allowing technicians to **diagnose power issues, detect short circuits, and replace faulty components with precision.**

- ✓ **Oscilloscopes help measure and analyze electrical signals for identifying faulty circuits.**
- ✓ **Microscopes assist in inspecting small SMD components, PCB damage, and solder joints.**
- ✓ **Proper use of these tools improves accuracy in diagnosing and fixing mobile motherboard faults.**

REPAIRING NETWORK & SIM CARD ISSUES

INTRODUCTION TO NETWORK & SIM CARD ISSUES IN MOBILE PHONES

What Are Network and SIM Card Issues?

Network and SIM card issues are common in mobile phones and can **disrupt calls, data connectivity, and messaging services**. These problems may arise due to **faulty SIM cards, network-related issues, software glitches, or hardware failures** in the mobile phone's network section.

✓ Common Network-Related Issues:

- No signal or weak signal strength.
- Mobile network not available.
- Call drops or unable to make/receive calls.
- Slow or no mobile data connectivity.

✓ Common SIM Card Issues:

- SIM card not detected.
- Invalid or corrupt SIM card error.
- No SIM card inserted warning.
- Network locked SIM card (carrier restriction).

Example:

A customer reports that their **phone frequently loses network signal** while making calls. The technician diagnoses the **antenna section of the phone's motherboard** and finds a loose network IC. After re-soldering, the issue is resolved.

DIAGNOSING NETWORK & SIM CARD ISSUES

Step 1: Checking for Software-Related Issues

✓ Check Airplane Mode:

- Go to **Settings > Connections** and ensure **Airplane Mode** is turned off.

✓ Manually Select Network:

- **Settings > Mobile Networks > Network Operators** and choose the carrier manually.

✓ Reset Network Settings:

- Navigate to **Settings > General Management > Reset > Reset Network Settings**.

✓ Update Phone Software:

- **Outdated firmware can cause network problems.** Check for software updates under **Settings > Software Update**.

✓ Example:

A user complains that their **phone is not connecting to mobile data**. The technician finds that **APN (Access Point Name) settings were incorrect**. After resetting APN settings, data starts working.

Step 2: Diagnosing SIM Card Problems

✓ Check for SIM Card Damage:

- Remove the SIM card and inspect for **scratches or bent pins**.

- Insert the SIM card into another phone to see if it works.

✓ Clean the SIM Card Slot:

- Dust or oxidation on SIM contacts can **prevent the phone from reading the SIM**.
- Use **isopropyl alcohol and a soft brush** to clean the contacts.

✓ Check SIM Card Tray and Pins:

- Ensure the SIM card **fits properly in the tray**.
- If the phone **does not detect SIM**, check for **bent or missing pins in the SIM slot**.

✓ Example:

A technician finds that a **customer's SIM card works in another phone but not in theirs**. Upon checking, a **broken SIM slot pin is detected**. The technician **replaces the SIM slot**, fixing the issue.

Step 3: Checking Hardware Network Components in a Mobile Motherboard

✓ Test the Antenna and Signal Lines:

- A faulty **antenna module** can cause weak or no network reception.
- Use a **multimeter in continuity mode** to check antenna connections.

✓ Check Network IC and RF Components:

- The **RF (Radio Frequency) section** on the motherboard is responsible for signal transmission and reception.

- If there is **no signal, no outgoing calls, or no mobile data**, test the **Network IC, Power Amplifier IC, and RF filter**.

✓ Checking for Short Circuits in the Network Section:

- Use a **multimeter** to check if there is a **short circuit in the power lines of the RF IC or network amplifier**.
- If a short is found, **replace the faulty component**.

✓ Example:

A customer's phone **shows full signal but cannot make calls**. The technician finds a **faulty network IC**, replaces it, and the phone starts making calls successfully.

Fixing Network & SIM Card Issues

Step 1: Fixing a SIM Card Not Detected Issue

- ✓ **Step 1: Check for SIM slot damage** and replace it if necessary.
- ✓ **Step 2: Re-solder the SIM connector pins** if they are loose.
- ✓ **Step 3: If the SIM card is network-locked, use a SIM unlocking tool** to remove carrier restrictions.
- ✓ **Step 4: If the SIM still does not work, replace the SIM IC on the motherboard.**

Step 2: Fixing No Network or Weak Signal Issues

- ✓ **Step 1: Check network settings and manually select the operator.**
- ✓ **Step 2: Replace a damaged network antenna or signal booster** if necessary.
- ✓ **Step 3: If the issue persists, reflow or replace the Network IC**

using a hot air rework station.

✓ **Step 4:** If the phone still does not detect the network, check for **RF circuit faults** and replace **faulty filters or amplifiers**.

Step 3: Fixing Mobile Data and WiFi Issues

✓ **Step 1:** Reset **APN settings** to default.

✓ **Step 2:** Replace the **WiFi IC** if WiFi keeps disconnecting.

✓ **Step 3:** If Bluetooth and WiFi are not working together, reflow the **WiFi/Bluetooth IC** on the motherboard.

Example:

A technician replaces a **faulty WiFi IC on a phone that had no WiFi connectivity**. After the replacement, the WiFi starts working again.

CASE STUDY: FIXING A PHONE WITH NO SIGNAL ISSUE

Scenario:

A customer brings a smartphone that **suddenly stopped showing any network signal**. The phone was working fine before, but now it does not connect to any mobile network.

Diagnosis:

✓ **Step 1:** The technician checks **SIM settings** and manually selects the network.

✓ **Step 2:** Tests another SIM card, but the phone still shows "No Service".

✓ **Step 3:** Opens the phone and **inspects the motherboard under a microscope**.

✓ **Step 4:** Finds that the **Network IC is loose due to overheating**.

Solution:

- ✓ **Step 1:** Uses a **hot air rework station** to reflow the Network IC.
 - ✓ **Step 2:** Tests the phone, but the issue remains.
 - ✓ **Step 3:** Replaces the **Network IC with a new one**.
 - ✓ **Step 4:** The phone now **detects the network and makes calls normally**.
-

Exercise

1. What are the common causes of a SIM card not being detected?
 2. How do you diagnose a faulty Network IC?
 3. Why is it important to check the SIM slot pins in a phone with SIM card errors?
 4. What role does the RF section play in network connectivity?
-

CONCLUSION

Troubleshooting **network and SIM card issues** requires **software diagnosis, hardware testing, and motherboard-level repairs**.

- ✓ **Software issues** (airplane mode, network settings, and firmware updates) should be checked first.
- ✓ **Physical damage** to the SIM slot, network antenna, or motherboard should be inspected under a microscope.
- ✓ **Advanced troubleshooting** involves testing the Network IC, RF amplifiers, and SIM connectors using a multimeter.

IDENTIFYING FAULTY COMPONENTS USING A MULTIMETER

INTRODUCTION TO USING A MULTIMETER IN MOBILE REPAIR

A **multimeter** is one of the most essential tools for diagnosing and troubleshooting mobile phone hardware issues. It helps in testing **voltage, resistance, continuity, and short circuits** to identify faulty components on a **printed circuit board (PCB)**.

✓ Why Use a Multimeter for Mobile Repair?

- To identify and replace faulty capacitors, resistors, diodes, transistors, and ICs.
- To check for short circuits in power lines.
- To verify battery and charging port functionality.
- To test PCB tracks and continuity between components.

Example:

A mobile phone does not **turn on**, and the technician suspects a **power IC failure**. Using a **multimeter in voltage mode**, they check the **power output from the battery to the motherboard** and find no voltage. The technician then replaces the **faulty Power IC**, and the phone starts working.

Understanding Multimeter Functions for Mobile Repair

Types of Multimeter Modes Used in Mobile Repair

✓ Continuity Mode (Buzzer Mode):

- Used to check for **short circuits and broken PCB tracks**.

- If the multimeter beeps, it means there is a **connection**.

✓ Voltage Mode (DC Voltage Testing):

- Used to check **battery voltage, power IC output, and charging port voltage**.
- Helps in diagnosing **no power issues in mobile phones**.

✓ Resistance Mode (Ohm Measurement):

- Used to test **resistors and PCB pathways**.
- A high resistance reading may indicate a **damaged component**.

✓ Diode Mode:

- Used to check **diodes, transistors, and other semiconductor components**.
- Helps in finding **open or shorted diodes on a motherboard**.

Testing Different Components Using a Multimeter

1. Testing a Mobile Phone Battery

✓ **Step 1:** Set the multimeter to **DC Voltage Mode**.

✓ **Step 2:** Place the **red probe on the battery's positive terminal (+)** and the **black probe on the negative terminal (-)**.

✓ **Step 3:** Check the reading:

- A **healthy lithium battery** should show **3.7V to 4.2V**.
- If the reading is **below 3.0V**, the battery is **dead** and needs replacement.

✓ Example:

A phone does not **power on**, and testing the battery shows **0V output**. The technician replaces the battery, and the phone starts working again.

2. Testing a Charging Port for Faults

✓ Step 1: Set the multimeter to **DC Voltage Mode**.

✓ Step 2: Connect the phone to a charger.

✓ Step 3: Place the **red probe on the positive terminal of the charging pin** and the **black probe on ground (GND)**.

✓ Step 4: Expected Reading:

- The voltage should be **5V** (USB standard).
- If there is **no voltage**, the charging port is faulty and should be replaced.

✓ Example:

A user complains their phone is **not charging**, and the technician finds that the charging port is **not delivering voltage to the battery**. They replace the charging port, and the phone starts charging normally.

3. Testing a Resistor on a Mobile Phone Motherboard

✓ Step 1: Set the multimeter to **Resistance Mode (Ω)**.

✓ Step 2: Place the **red and black probes on each side of the resistor**.

✓ Step 3: Compare the reading with the **marked resistor value**:

- If the reading matches the value, the resistor is working fine.

- If it shows **0Ω (shorted) or infinite resistance**, the resistor is faulty and must be replaced.

✓ **Example:**

A mobile phone has **no display**, and the technician finds that a **resistor in the display section is open (infinite resistance)**. After replacing it, the display starts working.

4. Testing a Capacitor on a Mobile Motherboard

✓ **Step 1:** Set the multimeter to **Continuity Mode**.

✓ **Step 2:** Place the **red probe on one terminal** and the **black probe on the other terminal**.

✓ **Step 3:** Expected Readings:

- If the multimeter beeps continuously, the capacitor is **shorted and must be replaced**.
- If there is no beep, switch to resistance mode and check for a stable **resistance value**.

✓ **Example:**

A phone is **overheating and turning off**, and the technician finds that a **capacitor in the power circuit is shorted**. After replacing it, the phone works normally.

5. Testing a Diode on a Mobile Phone PCB

✓ **Step 1:** Set the multimeter to **Diode Mode**.

✓ **Step 2:** Place the **red probe on the anode (+)** and the **black probe on the cathode (-)**.

✓ **Step 3:** Expected Readings:

- A good diode shows a **reading between 0.3V and 0.7V in one direction only**.
- If the multimeter beeps in both directions, the diode is **shorted**.
- If there is no reading, the diode is **open and faulty**.

✓ **Example:**

A technician tests a **faulty charging circuit** and finds that a **protection diode is shorted**. After replacing the diode, the phone starts charging normally.

CASE STUDY: DIAGNOSING A DEAD MOBILE PHONE WITH A MULTIMETER

Scenario:

A technician receives a **dead smartphone** that does not turn on or charge. The user reports that the phone suddenly stopped working after being plugged into a charger.

Diagnosis Using a Multimeter:

- ✓ **Step 1:** The technician tests the **battery voltage** and finds it at **0V** (dead battery).
- ✓ **Step 2:** After replacing the battery, the phone still does not turn on.
- ✓ **Step 3:** They test the **charging port voltage** and find **no output**.
- ✓ **Step 4:** The technician then checks the **Power IC** and finds a **short circuit**.
- ✓ **Step 5:** The faulty **Power IC** is removed and replaced, and the phone turns on successfully.

Discussion Questions:

1. How did the technician use a multimeter to diagnose the issue?
 2. What were the key tests performed?
 3. Why was the Power IC suspected as the main cause?
-

Exercise

1. What are the key uses of a multimeter in mobile phone repair?
 2. How can you test a mobile battery using a multimeter?
 3. Why is a shorted capacitor a common cause of mobile phone failure?
 4. Explain how to identify a faulty charging port using a multimeter.
-

CONCLUSION

A multimeter is an essential tool for **troubleshooting mobile hardware issues**, allowing technicians to **quickly diagnose and fix faulty components**.

- ✓ Continuity mode helps identify broken PCB tracks and short circuits.
- ✓ Voltage mode is useful for testing battery, charging, and power IC output.
- ✓ Resistance mode helps check resistors, capacitors, and PCB pathways.

✓ Diode mode is used to verify the health of semiconductors like diodes and transistors.

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USING JUMPER WIRE TECHNIQUES FOR BROKEN TRACES

INTRODUCTION TO JUMPER WIRE TECHNIQUES IN MOBILE REPAIR

What is a Jumper Wire Technique?

Jumper wire techniques are used in mobile phone repair to **restore broken circuit traces on a PCB (Printed Circuit Board)**. A jumper wire is a **thin, insulated copper wire** that is used to **reconnect broken connections** between components.

✓ Why Is Jumpering Necessary?

- PCB traces can break due to **physical damage, corrosion, or overheating**.
- Broken traces prevent signals from reaching the correct components.
- Jumper wires **restore connections without needing an entirely new PCB**.

✓ Common Issues That Require Jumpering:

- Broken charging lines causing no charging issues.
- Disconnected power lines leading to a dead phone.
- Damaged display lines causing no display issues.
- Missing or burnt PCB tracks due to short circuits.

Example:

A customer's phone **stopped charging** after it was dropped. Upon inspecting the motherboard, the technician finds that the **charging**

line is broken. By adding a **jumper wire** from the charging port to the **charging IC**, the phone starts charging again.

DIAGNOSING BROKEN PCB TRACES

Step 1: Identifying the Broken Circuit Line

✓ Visual Inspection:

- Remove the PCB shield and **inspect the motherboard under a microscope**.
- Look for **burnt, cracked, or missing tracks**.

✓ Testing with a Multimeter (Continuity Mode):

- Place one probe on the start of the trace and the other on the end.
- If the **multimeter beeps**, the track is fine.
- If **no beep**, the track is broken and needs a jumper wire.

✓ Example:

A phone with **no display** is tested, and the **display signal line** shows **no continuity**. The technician confirms a **broken trace** and prepares to add a jumper wire.

Step 2: Preparing for Jumpering

✓ Required Tools:

- **Fine Copper Jumper Wire (0.1mm – 0.2mm thick).**

- **Flux and Solder Paste** – Improves solder flow and prevents oxidation.
- **Soldering Iron (Fine Tip)** – For precise soldering.
- **Hot Air Rework Station** – For IC removal, if needed.
- **Microscope or Magnifying Glass** – To see the tiny PCB tracks.
- **Multimeter** – To check connections after repair.

✓ **Cleaning the PCB Area:**

- Use **isopropyl alcohol and a brush** to remove dust and corrosion.
- Apply a small amount of **flux** to the broken trace for better soldering.

✓ **Example:**

Before adding a jumper wire to a **power line**, the technician **cleans the PCB area with alcohol** to ensure a strong solder joint.

USING JUMPER WIRE TECHNIQUES TO REPAIR BROKEN TRACES

Step 1: Soldering the Jumper Wire to the First Connection Point

✓ **Apply a small amount of solder on the first connection point** (where the trace is broken).

✓ **Hold the thin jumper wire** with tweezers and attach it using a soldering iron.

✓ **Ensure the wire is securely connected and does not touch other components.**

✓ **Common Mistakes:**

Issue	Cause	Solution
Weak solder joint	Not enough flux	Apply more flux and reflow solder
Jumper wire touches other lines	Excessive solder used	Use a fine-tip soldering iron
Wire breaks easily	Poor wire placement	Secure wire with epoxy after soldering

✓ Example:

A technician repairs a **broken SIM card reader trace** by carefully attaching a **jumper wire from the SIM pin to the motherboard track**.

Step 2: Routing the Jumper Wire

✓ Ensure the jumper wire follows the original circuit path to avoid interference.

✓ If the wire crosses over other components, secure it with insulating tape or UV glue.

✓ Use the shortest possible wire to reduce resistance and avoid signal loss.

✓ Example:

A mobile phone with a **damaged WiFi signal line** is repaired using a **jumper wire that follows the same PCB routing to prevent interference**.

Step 3: Soldering the Jumper Wire to the Second Connection Point

- ✓ **Apply flux to the destination pad or component pin.**
- ✓ **Trim the jumper wire to the correct length and solder it securely.**
- ✓ **Check the continuity using a multimeter before reassembling the phone.**

✓ **Example:**

A technician repairing a **broken charging line** solders the jumper wire from the **charging port to the charging IC**, ensuring continuity before testing.

Case Study: Repairing a Broken Charging Line Using Jumper Wire

Scenario:

A customer's phone **stopped charging** after water damage. The technician disassembles the phone and finds that the **charging port is fine, but the charging line is broken on the PCB.**

Solution:

- ✓ **Step 1:** Uses a **multimeter in continuity mode** to confirm the broken charging track.
- ✓ **Step 2:** Cleans the area with **isopropyl alcohol** and **applies flux.**
- ✓ **Step 3:** Attaches a **thin jumper wire** from the **charging pin** to the **charging IC.**
- ✓ **Step 4:** Secures the wire with **UV glue** to prevent movement.
- ✓ **Step 5:** Reassembles the phone and **tests charging, which now works normally.**

Discussion Questions:

1. **Why was a jumper wire needed instead of replacing the charging port?**

2. **What precautions should be taken when routing a jumper wire?**
 3. **How can the technician ensure the wire does not break over time?**
-

Exercise

1. **Why is a microscope important in jumper wire repairs?**
 2. **How do you test a broken PCB trace using a multimeter?**
 3. **What precautions should be taken while soldering jumper wires?**
 4. **Describe a situation where jumper wire repair is better than replacing a component.**
-

CONCLUSION

Jumper wire techniques are essential for **repairing broken PCB traces** in mobile phone motherboards.

- ✓ **Multimeters help diagnose broken connections and confirm repairs.**
- ✓ **Fine jumper wires and precise soldering ensure a strong electrical connection.**
- ✓ **Proper routing and securing of jumper wires prevent future failures.**

ASSIGNMENT:

**REPLACE A FAULTY IC ON A MOTHERBOARD
AND TEST THE DEVICE**

**TROUBLESHOOT AND REPAIR A NO-
NETWORK SIGNAL ISSUE**

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REPLACING A FAULTY IC ON A MOTHERBOARD AND TESTING THE DEVICE – STEP-BY-STEP GUIDE

Introduction to IC Replacement in Mobile Repair

Integrated Circuits (ICs) are essential components on a **mobile phone motherboard**, controlling various functions such as **power management, charging, audio processing, and network communication**. A faulty IC can lead to multiple device malfunctions, including **no power, no charging, overheating, boot loops, or no display issues**.

✓ Common ICs That May Need Replacement:

- **Power Management IC (PMIC)** – Controls power distribution.
- **Charging IC** – Manages battery charging and voltage regulation.
- **Network IC (Baseband IC)** – Handles SIM and network communication.
- **Audio IC** – Responsible for sound processing.
- **CPU/GPU IC** – Processes system operations and graphics.

Example:

A technician receives a **dead phone** that does not respond to charging. Upon diagnosing, they find that the **charging IC is faulty** and needs replacement. After replacing the IC, the phone starts charging normally.

STEP-BY-STEP GUIDE TO REPLACING A FAULTY IC ON A MOBILE MOTHERBOARD

Step 1: Diagnosing the Faulty IC

✓ Use a Multimeter to Test the IC

1. Set the multimeter to **continuity mode (buzzer mode)**.
2. Place the **black probe on the ground (GND)** and the **red probe on the IC's input voltage pin**.
3. If the multimeter **beeps continuously**, the IC may be **shorted** and needs replacement.

✓ Check for Common Symptoms of a Faulty IC:

IC Type	Common Symptoms
Power IC	Phone is dead, no power, overheating
Charging IC	Phone does not charge or overheats while charging
Audio IC	No sound in calls, no ringtone, mic issues
Network IC	No network signal, SIM card not detected
Display IC	No display, screen flickering, dead pixels

✓ Example:

A phone **shows no charging response** when plugged in. The technician tests the **charging IC voltage output** and finds **0V instead of 5V**, indicating a **faulty charging IC**.

Step 2: Preparing for IC Removal

✓ Required Tools:

- **Hot Air Rework Station (350-400°C)** – For heating and desoldering the IC.

- **Soldering Iron (Fine Tip, 280-350°C)** – For precise soldering.
- **Flux (Liquid or Paste)** – Helps in smooth soldering and prevents oxidation.
- **Desoldering Wick** – Used to clean excess solder.
- **Tweezers** – For holding and positioning small components.
- **Multimeter** – To test after replacing the IC.

✓ **Safety Precautions:**

- Work in a **well-ventilated area**.
- Use **anti-static gloves and an ESD mat** to prevent damage.
- Avoid overheating **near plastic connectors or nearby ICs**.

✓ **Example:**

Before replacing a **Power IC**, the technician **cleans the area with isopropyl alcohol** and applies flux to make removal easier.

Step 3: Removing the Faulty IC

- ✓ **Step 1:** Apply a small amount of **flux** around the IC to ensure smooth desoldering.
- ✓ **Step 2:** Set the **hot air rework station** to **350-400°C**.
- ✓ **Step 3:** Heat the IC evenly for **20-30 seconds** while moving the hot air nozzle in a circular motion.
- ✓ **Step 4:** Once the solder melts, **gently lift the IC using tweezers**.
- ✓ **Step 5:** Use a **desoldering wick and soldering iron** to clean excess solder from the motherboard pads.

✓ **Common Issues While Removing an IC:**

Issue	Cause	Solution
IC not lifting	Insufficient heat	Increase temperature slightly and reheat
Nearby components move	Excessive heat	Use heat shields or lower airflow
PCB damage	Holding hot air too long	Move the nozzle in circular motion to distribute heat evenly

✓ Example:

A technician is replacing an **Audio IC** and ensures the **hot air nozzle is at the correct angle** to prevent damage to nearby capacitors.

Step 4: Installing the New IC

✓ **Step 1:** Apply a small amount of **flux** on the motherboard pads.

✓ **Step 2:** Align the **new IC correctly**, ensuring the **pin layout matches the board**.

✓ **Step 3:** Set the hot air rework station to **350°C** and heat the IC until it settles into position.

✓ **Step 4:** Gently press the IC using tweezers to ensure proper contact with solder pads.

✓ **Step 5:** Allow the IC to cool for **30-60 seconds** before testing.

✓ Example:

A technician replaces a **Network IC** and ensures the **IC pins are perfectly aligned before soldering**.

Step 5: Testing the Device After IC Replacement

- ✓ **Step 1:** Use a **multimeter** to **test voltage lines** around the new IC.
- ✓ **Step 2:** Power on the phone and check if the issue is resolved.
- ✓ **Step 3:** Test all functions related to the replaced IC.

✓ Expected Results After a Successful IC Replacement:

IC Replaced	Expected Outcome
Power IC	Phone turns on normally
Charging IC	Phone charges without overheating
Audio IC	Speaker, mic, and headphone jack work properly
Network IC	SIM card and network are detected
Display IC	Screen displays correctly without glitches

✓ Example:

A technician replaces a **Power IC**, reassembles the phone, and confirms that it now **powers on normally**.

CASE STUDY: REPLACING A FAULTY CHARGING IC

Scenario:

A customer reports that their smartphone **is not charging** despite using multiple chargers. The technician confirms that the **charging port is working**, but the phone **does not detect charging input**.

Diagnosis:

- ✓ **Step 1:** The technician checks the **charging port voltage** using a **multimeter** and finds **5V present**.

✓ **Step 2:** Tests the **charging IC output voltage**, which is **0V instead of 4.2V**.

✓ **Step 3:** Confirms that the **charging IC is faulty** and needs replacement.

Solution:

✓ **Step 1:** Uses a **hot air rework station** to remove the faulty charging IC.

✓ **Step 2:** Cleans the PCB pads and applies flux.

✓ **Step 3:** Installs a **new charging IC**, ensuring correct alignment.

✓ **Step 4:** Tests the voltage again and finds **4.2V output**, confirming a successful repair.

Outcome:

✓ **The phone charges properly** without any issues.

Discussion Questions:

1. **Why was the charging port tested before replacing the IC?**
2. **What precautions should be taken while using a hot air rework station?**
3. **How does testing the new IC with a multimeter ensure proper installation?**

Exercise

1. **What are the key indicators of a faulty IC in a mobile phone?**
2. **Describe the process of testing an IC using a multimeter.**
3. **Why is it important to align a new IC correctly before soldering?**

4. What are common mistakes made during IC removal and how can they be avoided?

CONCLUSION

Replacing a **faulty IC** on a mobile phone motherboard requires **diagnosing the issue, carefully removing the damaged IC, installing a new IC, and testing the phone to ensure functionality.**

- ✓ Proper use of a multimeter helps diagnose faulty ICs accurately.
- ✓ Hot air rework stations are essential for safe IC removal and replacement.
- ✓ Correct IC alignment and testing ensure a successful repair.

TROUBLESHOOTING AND REPAIRING A NO-NETWORK SIGNAL ISSUE – STEP-BY-STEP GUIDE

Introduction to No-Network Signal Issues in Mobile Phones

A **no-network signal issue** occurs when a mobile phone **fails to detect the carrier network**, leading to problems such as **no service, emergency calls only, SIM not detected, or weak signal reception**. These issues can be caused by **software glitches, SIM card failures, network IC faults, antenna damage, or motherboard defects**.

✓ Common Symptoms of a No-Network Signal Issue:

- “No Service” or “Emergency Calls Only” displayed on the screen.
- Unable to make or receive calls.
- Frequent call drops or fluctuating signal strength.
- Mobile data not working despite proper APN settings.
- SIM card not detected.

Example:

A customer brings in a smartphone that **stopped detecting any network signal** after a firmware update. The technician tests the phone’s **network settings and hardware components** before concluding that the **network IC is faulty and needs replacement**.

Step-by-Step Guide to Troubleshooting and Repairing a No-Network Signal Issue

Step 1: Checking for Software-Related Issues

Before diagnosing hardware faults, check for **software-related issues** that might cause network problems.

✓ **1. Restart the Phone**

- Power off the phone and restart it to refresh network connections.

✓ **2. Check Airplane Mode**

- Go to **Settings > Connections** and ensure that **Airplane Mode** is OFF.

✓ **3. Manually Select Network Operator**

- Navigate to **Settings > Mobile Networks > Network Operators**.
- Search for available networks and manually select the carrier.

✓ **4. Reset Network Settings**

- Go to **Settings > General Management > Reset > Reset Network Settings**.
- This will **clear any incorrect network configurations** and restore default settings.

✓ **5. Check for Software Updates**

- Go to **Settings > Software Update** and check for any pending updates.
- Some updates fix **network-related bugs and compatibility issues**.

✓ **Example:**

A user's phone **loses network** after a **software update**. The

technician resets network settings, and the signal is restored successfully.

Step 2: Diagnosing SIM Card and Carrier Issues

If the phone's **software and network settings are correct**, check the **SIM card and carrier-related issues**.

✓ 1. Check the SIM Card in Another Phone

- Remove the SIM card and insert it into another phone.
- If the SIM works in another device, the issue is **with the phone's hardware or settings**.

✓ 2. Try a Different SIM Card

- Insert a different SIM card into the faulty phone.
- If the new SIM works, the **original SIM card may be faulty or inactive**.

✓ 3. Clean the SIM Card Slot

- Dust or corrosion in the **SIM tray** can prevent the phone from detecting the SIM.
- Use **isopropyl alcohol and a soft brush** to clean the contacts.

✓ 4. Check for Network Lock

- Some phones are **locked to a specific carrier** and will not accept other SIM cards.
- Dial **#06# to check IMEI status** and verify with the carrier.

✓ Example:

A phone does not **detect the SIM card**, but when the SIM is inserted into another phone, it works. The technician finds **dust in the SIM tray**, cleans it, and the phone starts detecting the SIM.

Step 3: Checking Antenna and Network Signal Components

If the **SIM card is working** but the phone still has **no network signal**, the issue may be **hardware-related**.

✓ 1. Check the Mobile Network Antenna

- A **loose or damaged antenna module** can cause weak or no signal.
- Disassemble the phone and inspect the **antenna connection on the motherboard**.

✓ 2. Use a Multimeter to Test Antenna Connectivity

- Set the multimeter to **continuity mode**.
- Place the probes on the **antenna contacts and ground**.
- If there is **no continuity**, the antenna is faulty and must be replaced.

✓ 3. Inspect the RF Signal Amplifier

- The **RF (Radio Frequency) amplifier** is responsible for boosting the network signal.
- If the phone **gets weak signals but no calls**, the RF amplifier may be faulty.

✓ Example:

A phone shows a **weak signal even in strong network areas**. The technician finds a **loose antenna connection** on the motherboard and resolders it, restoring the signal.

Step 4: Testing the Network IC (Baseband IC) for Hardware Issues**✓ 1. Locate the Network IC (Baseband IC) on the Motherboard**

- The **Network IC** controls SIM detection and network registration.
- If the phone shows "**No Service**" even after trying different **SIM cards**, the Network IC may be faulty.

✓ 2. Use a Multimeter to Test the Network IC

- Set the multimeter to **continuity mode**.
- Check for **short circuits** on the power lines of the **Network IC**.
- If the IC is **shorted or has no voltage output**, it must be replaced.

✓ 3. Reflow or Replace the Network IC

- Apply **flux** around the Network IC.
- Use a **hot air rework station (350-400°C)** to heat and reflow the IC.
- If reflowing does not fix the issue, replace the IC with a **new one**.

✓ Example:

A phone displays "**No Service**" even after multiple software resets.

The technician tests the **Network IC voltage** and finds it **dead**. After replacing the IC, the phone connects to the network.

Step 5: Final Testing and Reassembly

✓ 1. Insert the SIM Card and Check Signal Strength

- Ensure the phone **registers on the network** and makes calls.

✓ 2. Test Mobile Data Connectivity

- Turn on **Mobile Data** and verify that it connects properly.

✓ 3. Perform a Call and SMS Test

- Make a test call and send an SMS to confirm full functionality.

✓ 4. Reassemble the Phone and Perform a Final Check

- Ensure all connections are secure before closing the device.

✓ Example:

A technician replaces a faulty **Network IC**, reassembles the phone, and tests calling and mobile data, confirming the fix.

CASE STUDY: FIXING A NO-NETWORK ISSUE ON A SMARTPHONE

Scenario:

A customer reports that their phone **stopped detecting network signals** after a drop. The phone does not show any signal bars, and manual network selection fails.

Diagnosis:

- ✓ **Step 1:** The technician **resets network settings** and updates the software.
- ✓ **Step 2:** Tests a **different SIM card**, but the phone still shows "**No Service**".
- ✓ **Step 3:** Opens the phone and finds that the **antenna connector is loose**.
- ✓ **Step 4:** After reattaching the antenna, the phone gets weak signal reception.
- ✓ **Step 5:** Tests the **Network IC voltage** and finds it faulty.

Solution:

- ✓ **Step 1:** Uses a **hot air rework station** to remove and replace the faulty Network IC.
- ✓ **Step 2:** Reassembles the phone and tests for network registration.
- ✓ **Step 3:** The phone now **detects the network and functions normally**.

Exercise

1. **What are the common causes of a no-network signal issue?**
2. **How does resetting network settings help in troubleshooting?**
3. **What are the steps to test a faulty Network IC using a multimeter?**
4. **Why is it important to check the antenna before replacing major components?**

CONCLUSION

Troubleshooting **no-network signal issues** requires a **systematic approach**, starting from **software checks to hardware diagnosis**.

- ✓ **Network settings, SIM card issues, and firmware updates should be checked first.**
- ✓ **Antenna and RF components must be tested for loose connections or faults.**
- ✓ **Network IC failure can cause no-service issues and may require reflowing or replacement.**

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