ISDM (INDEPENDENT SKILL DEVELOPMENT MISSION)

UNDERSTANDING STOCK ROM & CUSTOM ROM

INTRODUCTION TO ROM IN MOBILE DEVICES

A **ROM (Read-Only Memory)** in mobile devices refers to the **operating system and firmware that run on a smartphone**. Every smartphone has a pre-installed **Stock ROM (official firmware)** provided by the manufacturer, but users can replace it with a **Custom ROM** for additional features and performance improvements.

ROM plays a critical role in defining **device performance, security, and user experience**. Understanding the difference between **Stock ROM and Custom ROM** is essential for mobile repair technicians and advanced users who want to modify or optimize their devices.

KEY FUNCTIONS OF ROM IN MOBILE DEVICES

✓ **Controls system behavior and user interface (UI)**.
✓ **Manages hardware resources (CPU, RAM, Battery, Sensors, etc.)**.
✓ **Handles security features and updates**.
✓ **Determines app compatibility and software optimization**.

STOCK ROM – OFFICIAL FIRMWARE FROM MANUFACTURERS

What is Stock ROM?

A **Stock ROM** is the official operating system installed on a device by the **manufacturer (Samsung, Xiaomi, OnePlus, etc.)**. It is **optimized, stable, and tested for security and performance**.

Features of Stock ROM

✓ Pre-installed with manufacturer apps and UI (e.g., Samsung One UI, MIUI, OxygenOS).
✓ Regular software updates and security patches.
✓ Stable and optimized for long-term device performance.
✓ Protected by bootloader security (cannot be modified easily).

Advantages of Stock ROM

✓ Reliable and less prone to software bugs.
✓ Guaranteed manufacturer support and updates.
✓ Full compatibility with device hardware.

Disadvantages of Stock ROM

✗ Contains bloatware (pre-installed apps that cannot be removed).
✗ Limited customization options.
✗ Slower software updates compared to Custom ROMs.

Example: Stock ROM in Samsung Phones

Samsung devices come with **Samsung One UI**, which is a **Stock ROM** based on Android but modified by Samsung for **additional features like Samsung Pay, Knox Security, and Edge Panels**.

CUSTOM ROM – MODIFIED OPERATING SYSTEMS

What is a Custom ROM?

A **Custom ROM** is an unofficial version of the Android operating system developed by third-party developers. It **replaces the Stock ROM and offers advanced customization, better performance, and additional features**.

Custom ROMs are based on **Android Open Source Project (AOSP)** and allow users to **modify their devices beyond manufacturer restrictions**.

Features of Custom ROM

✓ **Lightweight and free from bloatware.**
✓ **Offers advanced customization options (themes, UI tweaks, gestures).**
✓ **Improved battery life and performance optimizations.**
✓ **Supports newer Android versions after official updates stop.**

Popular Custom ROMs

Custom ROM	Based On	Key Features
LineageOS	AOSP	Lightweight, stable, frequent updates
Pixel Experience	Stock Android	Pure Google UI, no bloatware
Resurrection Remix	AOSP	Highly customizable, advanced gestures
Havoc OS	AOSP	Smooth performance, battery optimization

Advantages of Custom ROM

✓ Full control over system settings and UI customization.

✓ Better performance and battery life improvements.

✓ Ability to remove unwanted apps (bloatware).

✓ Continued updates even after manufacturer support ends.

Disadvantages of Custom ROM

✗ Requires bootloader unlocking, which voids the warranty.

✗ May contain stability bugs and require frequent updates.

✗ Not all Custom ROMs support banking apps due to security restrictions.

Example: Installing Pixel Experience on a Xiaomi Phone

A user replaces **MIUI Stock ROM** with **Pixel Experience Custom ROM** to enjoy a **clean, Google-based UI without bloatware**.

Differences Between Stock ROM & Custom ROM

Feature	Stock ROM	Custom ROM
Security	High, with manufacturer protection	Moderate, depends on the ROM developer
Updates	Regular, but slow	Fast, but requires manual installation
Customization	Limited	Extensive
Performance	Optimized for stability	Can be optimized for speed or battery life
Bloatware	Pre-installed manufacturer apps	No unnecessary apps

Case Study: A User's Experience with Stock ROM vs Custom ROM

Scenario:

A user owns a **OnePlus 6T** with Stock ROM but finds it slow after years of updates. They decide to install **LineageOS Custom ROM** to improve performance.

Process & Outcome:

1. **Unlocked the Bootloader** using Fastboot commands.

2. **Installed TWRP Custom Recovery** to flash a new ROM.

3. **Flashed LineageOS** and rebooted the device.

4. **Observed faster performance, better battery life, and a clean Android UI**.

✓ **Result:** The device performed better than before, proving that Custom ROMs can extend the life of older smartphones.

Exercise

1. **What is the main difference between Stock ROM and Custom ROM?**

2. **List two advantages and two disadvantages of Custom ROMs.**

3. **How do you install a Custom ROM on an Android phone?**

4. **Why do manufacturers lock the bootloader on Stock ROMs?**

5. **Which Custom ROM is best for performance and battery life?**

CONCLUSION

✓ **Stock ROM is the safest and most stable option for everyday users**, while **Custom ROMs offer more flexibility and customization**.

✓ **Custom ROMs provide better performance but require technical knowledge to install**.

✓ **Stock ROMs receive official updates, whereas Custom ROMs rely on community support**.

✓ **Choosing between Stock ROM and Custom ROM depends on the user's need for security, updates, and customization**.

INTRODUCTION TO FLASHING TOOLS (SP FLASH TOOL, ODIN, MI FLASH, ETC.)

Understanding Flashing & Flashing Tools

Flashing refers to the **process of reinstalling or upgrading the firmware (ROM) of a mobile device**. It is a crucial aspect of mobile repair and software troubleshooting, allowing technicians to fix **bricked devices, upgrade software, remove bloatware, and bypass security locks**.

Flashing tools are **software programs** designed to facilitate the process of installing a new firmware version onto a mobile device. These tools are essential for **restoring corrupted systems, unlocking bootloaders, or installing custom ROMs**.

Why Is Flashing Necessary?

✔ **Fixes software issues** like boot loops, black screens, or OS corruption.

✔ **Upgrades or downgrades firmware** to improve performance and compatibility.

✔ **Removes unwanted software (bloatware)** pre-installed by manufacturers.

✔ **Unlocks network** restrictions and bypasses security locks (FRP, IMEI repair).

✔ **Allows installation of custom ROMs and kernels** for better performance.

Different mobile chipsets require **specific flashing tools**. The most commonly used ones include **SP Flash Tool (MediaTek), Odin (Samsung), and Mi Flash Tool (Xiaomi)**.

SP FLASH TOOL – FLASHING FIRMWARE ON MEDIATEK DEVICES

What is SP Flash Tool?

SP Flash Tool (Smart Phone Flash Tool) is a **powerful flashing software used for MediaTek (MTK) chipset devices**. It allows users to flash stock ROMs, custom ROMs, recovery images, and repair IMEI.

Key Features of SP Flash Tool

✓ **Flashes firmware (scatter files) on MediaTek devices.**

✓ **Fixes dead/bricked phones by reinstalling the system.**

✓ **Performs memory tests and format operations.**

✓ **Allows IMEI repair and NVRAM restoration.**

Steps to Flash a ROM Using SP Flash Tool

1. **Download the Required Files:**

    o SP Flash Tool

    o Stock ROM (Scatter File) for the specific device

    o USB Drivers for MediaTek devices

2. **Launch SP Flash Tool and Load the Scatter File.**

3. **Select 'Download Only' Mode and Click the 'Download' Button.**

4. **Connect the Phone in Flash Mode (Hold Volume Down & Connect via USB).**

5. **Wait for Flashing to Complete and Reboot the Device.**

✓ **Outcome:** The phone boots up with the newly installed firmware.

Example: Fixing a Dead MediaTek Phone

A **Redmi Note 8 Pro (MediaTek Helio G90T)** gets stuck in a **boot loop** after a failed update. Using **SP Flash Tool,** a technician successfully flashes the **official ROM,** reviving the phone.

ODIN – SAMSUNG FIRMWARE FLASHING TOOL

What is Odin?

Odin is Samsung's **official firmware flashing tool,** used to install **stock ROMs, recovery images, and custom kernels** on Samsung devices. It is widely used for:

✓ **Flashing stock firmware to unbrick Samsung devices.**

✓ **Rooting Samsung phones by flashing custom recoveries like TWRP.**

✓ **Removing bloatware by installing a clean firmware version.**

Steps to Flash a Samsung Device Using Odin

1. **Download the Required Files:**

   o Odin Flash Tool

   o Samsung Stock ROM (in .tar or .md5 format)

   o Samsung USB Drivers

2. **Boot the Phone into Download Mode:**

   o Power off the device.

   o Press **Power + Volume Down + Home** (For older devices) or **Power + Volume Down + Bixby** (Newer models).

3. **Launch Odin and Load Firmware Files.**

4. **Click the 'Start' Button to Begin Flashing.**

5. **Wait for Odin to Show 'PASS' and Reboot the Phone.**

✓ **Outcome:** The Samsung phone is successfully restored or upgraded.

Example: Removing FRP Lock Using Odin

A **Samsung Galaxy A52** is stuck at the **Google Account FRP Lock screen** after a factory reset. Using **Odin,** the technician flashes **a combination firmware** that removes the lock and restores access.

Mi Flash Tool – Flashing Firmware on Xiaomi Devices

What is Mi Flash Tool?

Mi Flash Tool is **Xiaomi's official firmware flashing tool**, designed for **flashing stock ROMs on MIUI-based devices**. It supports both **Qualcomm and MediaTek chipsets**.

Key Features of Mi Flash Tool

✓ **Flashes Fastboot ROMs on Xiaomi devices.**
✓ **Unlocks bootloader and allows installation of custom ROMs.**
✓ **Fixes bricked phones by reinstalling MIUI firmware.**

Steps to Flash a Xiaomi Device Using Mi Flash Tool

1. **Download the Required Files:**

   o Mi Flash Tool

   o Fastboot ROM for the Xiaomi model

   o Xiaomi USB Drivers

2. **Boot the Device into Fastboot Mode:**

   o Power off the device.

   o Press **Power + Volume Down** and connect it to a PC.

3. **Load the Fastboot ROM into Mi Flash Tool.**

4. **Select 'Clean All' Option and Click 'Flash'.**

5. **Wait for Flashing to Complete and Reboot the Device.**

✓ **Outcome:** The phone successfully boots into MIUI firmware.

Example: Fixing a Boot Loop Issue on a Xiaomi Phone

A **Redmi Note 10** is stuck in a boot loop after an **incomplete MIUI update**. Using **Mi Flash Tool**, the technician installs the **official Fastboot ROM**, fixing the issue.

Comparison of Flashing Tools

Flashing Tool	Supported Devices	Main Purpose
SP Flash Tool	MediaTek Devices	Flash firmware, repair IMEI, unbrick phones
Odin	Samsung Devices	Install stock firmware, remove FRP, root devices
Mi Flash Tool	Xiaomi Devices	Flash MIUI ROMs, unlock bootloader, fix bricked phones

CASE STUDY: REPAIRING A DEAD PHONE WITH FLASHING TOOLS

Scenario:

A technician receives a **Samsung Galaxy S21 Ultra,** which is completely **unresponsive after a failed update**. The phone does not boot into the OS, but Download Mode works.

Solution:

1. **Entered Download Mode (Power + Volume Down + Bixby).**

2. **Connected the phone to a PC and launched Odin.**

3. **Loaded the official Samsung stock firmware (.md5 file).**

4. **Flashed the firmware using Odin.**

5. **Phone rebooted successfully, and all software issues were resolved.**

✓ **Result:** The phone was restored without losing network access or device security.

Exercise

1. **What is the primary function of SP Flash Tool?**

2. **List three benefits of using Odin for Samsung devices.**

3. **How does Mi Flash Tool help Xiaomi users recover from software issues?**

4. **What is the key difference between Fastboot Mode and Download Mode?**

5. **Describe a situation where flashing a stock ROM is necessary.**

CONCLUSION

✓ **Flashing tools are essential for restoring and repairing mobile firmware, fixing software issues, and unbricking devices.**

✓ **SP Flash Tool is ideal for MediaTek devices, Odin is used for Samsung flashing, and Mi Flash Tool is Xiaomi's official flashing tool.**

✓ **Each flashing tool has specific steps for firmware installation, requiring technical knowledge and careful execution.**

✓ **Mastering these tools enables mobile technicians to troubleshoot software failures, remove security locks, and enhance device performance.**

FIRMWARE BACKUP & RESTORATION TECHNIQUES

INTRODUCTION TO FIRMWARE BACKUP & RESTORATION

Firmware is the **software layer that controls the hardware functions** of a mobile device. It is stored in the **Read-Only Memory (ROM)** and consists of the **operating system, kernel, system partitions, and bootloader**.

Backing up firmware is **essential before flashing, rooting, or modifying the system** to prevent permanent data loss. Restoration techniques are used to **recover a bricked phone, fix system corruption, or roll back to a previous firmware version**.

Why is Firmware Backup & Restoration Important?

✓ **Prevents data loss before flashing stock or custom ROMs.**
✓ **Restores a bricked phone to working condition.**
✓ **Allows downgrading to an older firmware version.**
✓ **Fixes boot loops, black screens, and corrupted partitions.**
✓ **Helps in device unlocking and IMEI repair.**

Backup and restoration techniques vary depending on the **device brand, chipset, and software tools used**.

FIRMWARE BACKUP TECHNIQUES

What is Firmware Backup?

Firmware backup refers to **saving a copy of the system software (ROM) and its critical partitions** before making any modifications. It

ensures that users can **restore their devices to the original state** if something goes wrong.

Types of Firmware Backup

✓ **Full Firmware Backup** – Creates a **complete image** of the ROM, including boot, system, recovery, and user partitions.

✓ **Partial Backup** – Saves only critical partitions like **bootloader, system.img, and recovery**.

✓ **NVRAM/IMEI Backup** – Backs up **network configurations, IMEI, and baseband settings** to prevent loss of mobile connectivity.

Methods to Backup Firmware

1. Using SP Flash Tool (For MediaTek Devices)

✓ Suitable for **MediaTek (MTK) chipset smartphones**.

✓ Requires a **scatter file** (firmware structure file).

✓ Saves system partitions for later restoration.

Steps to Backup Firmware with SP Flash Tool:

1. **Download and Install SP Flash Tool** on a Windows PC.

2. **Install MediaTek USB Drivers** for device detection.

3. **Load Scatter File** from the existing firmware.

4. **Select 'Readback' Mode** and choose the partitions to back up.

5. **Start the Backup Process** and save the ROM file.

✓ **Outcome:** The entire firmware is saved, preventing loss after flashing.

2. Using TWRP (For Custom Recovery Backup on Android)

✓ Suitable for **rooted devices with a custom recovery installed**.

✓ Creates **Nandroid backups** (full system images).

Steps to Backup Firmware with TWRP Recovery:

1. **Boot into TWRP Recovery Mode** (Power + Volume Up).

2. **Select 'Backup'** and choose partitions (Boot, System, Data, EFS).

3. **Swipe to Start Backup** and wait for the process to complete.

4. **Save the backup to an external SD card or USB storage.**

✓ **Outcome:** A complete system backup is created for future restoration.

---

3. Using ADB & Fastboot (For Qualcomm & Other Devices)

✓ Best for **creating a backup without installing custom recovery**.

✓ Requires a PC with **Android SDK tools (ADB & Fastboot)**.

Steps to Backup Firmware Using ADB:

1. **Connect the Phone to a PC and Enable USB Debugging.**

2. **Use the Command:**

3. adb backup -all -apk -shared -f backup.ab

4. **Save the Backup File to PC for Restoration Later.**

✓ **Outcome:** The system and app data are safely backed up.

FIRMWARE RESTORATION TECHNIQUES

What is Firmware Restoration?

Firmware restoration refers to **reinstalling a backup or flashing stock firmware** when a device is bricked, corrupted, or needs a downgrade.

Methods to Restore Firmware

1. Using SP Flash Tool (For MediaTek Devices)

✓ Restores **full firmware using a scatter file**.
✓ Fixes **boot loops, black screens, and bricked devices**.

Steps to Restore Firmware Using SP Flash Tool:

1. **Open SP Flash Tool and Load Scatter File.**

2. **Select 'Download Only' Mode to Restore System Files.**

3. **Connect the Phone in Flash Mode and Click 'Download'.**

4. **Wait for the Process to Complete and Reboot the Phone.**

✓ **Outcome:** The phone is restored to the original firmware.

---

2. Using Odin (For Samsung Devices)

✓ Used to **flash stock firmware and recover bricked Samsung phones**.

Steps to Restore Firmware Using Odin:

1. **Download Official Samsung Firmware (in .tar.md5 format).**

2. **Boot the Phone into Download Mode (Power + Volume Down + Home).**

3. **Launch Odin and Load the Firmware File.**

4. **Click 'Start' to Begin the Flashing Process.**

✓ **Outcome:** The Samsung device is restored to factory firmware.

---

3. Using Mi Flash Tool (For Xiaomi Devices)

✓ Used for **restoring MIUI firmware on Xiaomi phones**.

Steps to Restore Firmware Using Mi Flash Tool:

1. **Download and Install Mi Flash Tool on PC.**

2. **Load the Fastboot ROM for the Device.**

3. **Put the Phone in Fastboot Mode (Power + Volume Down).**

4. **Click 'Flash' to Restore the Stock Firmware.**

✓ **Outcome:** The Xiaomi device is recovered with official MIUI firmware.

CASE STUDY: RESTORING A BRICKED PHONE WITH FIRMWARE BACKUP

Scenario:

A user tries to install a custom ROM on a **Samsung Galaxy S21**, but the process fails, leaving the phone stuck on the boot screen.

Solution:

1. The technician **boots the phone into Download Mode (Power + Volume Down + Bixby).**

2. **Uses Odin to flash the original Samsung stock firmware.**

3. **Waits for Odin to show 'PASS' and reboots the phone.**

✓ **Result:** The phone successfully boots into the restored firmware.

Exercise

1. **Why is it important to back up firmware before flashing a new ROM?**

2. **What is the difference between a Full Firmware Backup and a Partial Backup?**

3. **List three tools used for firmware restoration and the devices they support.**

4. **Describe the process of backing up a MediaTek device using SP Flash Tool.**

5. **How does TWRP help in creating and restoring firmware backups?**

CONCLUSION

✓ **Firmware backup ensures that a device can be restored if flashing goes wrong.**

✓ **SP Flash Tool, Odin, and Mi Flash Tool are essential for restoring firmware on different devices.**

✓ **Backing up NVRAM and IMEI prevents network issues after flashing.**

✓ **Mastering firmware backup and restoration techniques helps prevent software failures and data loss.**

FLASHING DIFFERENT CHIPSET DEVICES (QUALCOMM, MEDIATEK, EXYNOS, ETC.)

INTRODUCTION TO FLASHING DIFFERENT CHIPSET DEVICES

Flashing refers to the **process of installing or updating the firmware on a mobile device**. Different chipsets require **specific flashing tools and techniques** due to variations in architecture, security implementations, and boot processes.

The most common mobile chipsets include:

✓ **Qualcomm (Snapdragon)** – Used in flagship Android devices.

✓ **MediaTek (MTK)** – Popular in budget and mid-range smartphones.

✓ **Exynos** – Samsung's in-house chipset, found in Galaxy devices.

✓ **Unisoc (Spreadtrum)** – Used in low-cost and entry-level devices.

Each chipset has **its own method for flashing firmware**, requiring specific tools such as **QPST, SP Flash Tool, Odin, and Research Download Tool**.

FLASHING QUALCOMM (SNAPDRAGON) DEVICES

What is Qualcomm Snapdragon?

Qualcomm Snapdragon chipsets are widely used in **Samsung, OnePlus, Xiaomi, Vivo, and Oppo smartphones**. These processors have **secure boot mechanisms,** and firmware flashing requires unlocking the bootloader.

Tools Required for Flashing Qualcomm Devices

✓ **QPST (Qualcomm Product Support Tool)** – Used to flash stock firmware on Qualcomm devices.

✓ **Xiaomi Mi Flash Tool** – For flashing MIUI firmware on Qualcomm-based Xiaomi devices.

✓ **Fastboot & ADB** – Required for unlocking the bootloader and flashing system partitions.

Steps to Flash a Qualcomm Device Using QPST

1. **Install Qualcomm USB Drivers & QPST on PC.**

2. **Boot the Phone into EDL (Emergency Download) Mode.**

   o Press **Volume Up + Volume Down + Connect USB Cable** (varies by device).

3. **Launch QFIL Tool (Inside QPST) and Load the Firmware (.mbn file).**

4. **Click 'Download' to Start the Flashing Process.**

5. **Wait for Completion and Reboot the Device.**

✓ **Outcome:** The Qualcomm device is restored with the official firmware.

Example: Fixing a Bricked Qualcomm Device Using QPST

A **OnePlus 9 Pro** gets stuck in a boot loop after a failed update. Using **QPST**, the technician flashes the stock ROM, successfully reviving the device.

FLASHING MEDIATEK (MTK) DEVICES

What is MediaTek (MTK)?

MediaTek processors are found in **Redmi, Realme, Tecno, Infinix, and other budget smartphones**. Flashing firmware on these devices is simpler but requires **a scatter file** (firmware structure file).

Tools Required for Flashing MediaTek Devices

✓ **SP Flash Tool (Smart Phone Flash Tool)** – The most commonly used tool for flashing MTK firmware.

✓ **Maui Meta Tool** – Used to restore IMEI and baseband after flashing.

Steps to Flash a MediaTek Device Using SP Flash Tool

1. **Download and Install SP Flash Tool & MediaTek USB Drivers.**

2. **Extract the Stock Firmware and Load the Scatter File in SP Flash Tool.**

3. **Select 'Download Only' and Click the 'Download' Button.**

4. **Power Off the Phone and Connect it via USB in Flash Mode.**

5. **Wait for the Flash Process to Complete and Reboot the Phone.**

✓ **Outcome:** The MediaTek device is restored or updated successfully.

Example: Flashing a Corrupt Firmware on a MediaTek Device

A **Redmi Note 8 Pro** (MediaTek Helio G90T) fails to boot after a custom ROM installation. Using **SP Flash Tool**, the technician installs the official stock ROM and restores functionality.

FLASHING EXYNOS (SAMSUNG) DEVICES

What is Exynos?

Exynos is **Samsung's in-house chipset**, commonly found in **Galaxy S-series, A-series, and Note-series devices**. Unlike Qualcomm, Exynos firmware requires **Samsung Odin for flashing**.

Tools Required for Flashing Exynos Devices

✓ **Odin Flash Tool** – Used for flashing stock firmware on Samsung Exynos devices.

✓ **Samsung USB Drivers** – Required for proper device recognition.

Steps to Flash an Exynos Device Using Odin

1. **Download Samsung Firmware (.tar.md5) and Install Odin.**

2. **Boot the Phone into Download Mode (Power + Volume Down + Home/Bixby).**

3. **Launch Odin and Load the Firmware Files (AP, BL, CP, CSC).**

4. **Click 'Start' to Begin the Flashing Process.**

5. **Wait for Odin to Show 'PASS' and Reboot the Phone.**

✓ **Outcome:** The Samsung Exynos phone is successfully restored.

Example: Removing FRP Lock from a Samsung Exynos Phone

A **Samsung Galaxy S21 Ultra (Exynos 2100)** is locked with **Factory Reset Protection (FRP)**. Using **Odin,** the technician flashes a combination firmware to remove the lock.

Comparison of Flashing Techniques for Different Chipsets

Chipset	Flashing Tool	Boot Mode Required	Firmware Format
Qualcomm	QPST, Mi Flash Tool	**EDL Mode, Fastboot Mode**	.mbn, .img
MediaTek	SP Flash Tool	**Flash Mode (Preloader)**	Scatter (.txt)
Exynos (Samsung)	Odin	**Download Mode**	.tar.md5

CASE STUDY: FLASHING A QUALCOMM VS MEDIATEK DEVICE

Scenario:

A technician receives **two bricked smartphones**:

1. A **Realme C15 (MediaTek Helio G35)** stuck in a boot loop.

2. A **Poco F3 (Qualcomm Snapdragon 870)** showing a **black screen** after a failed update.

Solution:

✓ **For Realme C15 (MediaTek)**

- Used **SP Flash Tool** to load the scatter file.

- Flashed the **stock firmware** successfully.

✓ **For Poco F3 (Qualcomm)**

- Entered **EDL Mode** and used **QPST to flash the firmware**.

- Restored the **phone's IMEI using Maui Meta Tool**.

✓ **Result:** Both phones were **successfully unbricked** and restored to factory settings.

Exercise

1. **What flashing tool is used for Qualcomm devices?**

2. **List the steps to flash a MediaTek phone using SP Flash Tool.**

3. **Why is Odin required for flashing Samsung Exynos devices?**

4. **What is the purpose of an EDL mode in Qualcomm flashing?**

5. **Compare the firmware formats used for Qualcomm, MediaTek, and Exynos devices.**

CONCLUSION

✓ **Flashing firmware is essential for repairing software issues, updating devices, and unbricking phones.**

✓ **Qualcomm devices use QPST & Mi Flash Tool, while MediaTek phones require SP Flash Tool.**

✓ **Samsung Exynos phones require Odin for flashing stock firmware.**

✓ **Different chipsets have different flashing procedures and security implementations.**

✓ **Understanding chipset-specific flashing techniques ensures successful firmware recovery and system updates.**

RESOLVING BOOT LOOP & SOFT-BRICKED PHONES

UNDERSTANDING BOOT LOOP & SOFT-BRICKED PHONES

Mobile devices rely on firmware and system files to function properly. If a phone fails to load the operating system correctly, it may enter a **boot loop** or become **soft-bricked**. These issues occur when the device keeps restarting or gets stuck on the boot logo without fully booting into the system.

A **boot loop** is a common software issue where the phone repeatedly reboots without reaching the home screen. A **soft-bricked** device is a phone that cannot boot properly but can still access **Recovery Mode or Fastboot Mode**, meaning it can be fixed through software troubleshooting.

KEY CAUSES OF BOOT LOOP & SOFT-BRICKED PHONES

✓ **Failed system update or interrupted OTA installation.**

✓ **Flashing incompatible or corrupted firmware.**

✓ **Incorrect modifications to system files (e.g., rooting, custom ROMs).**

✓ **Malware infections or corrupted applications.**

✓ **Insufficient storage or a problematic cache partition.**

Symptoms of Boot Loop & Soft-Bricking

✓ **Phone stuck on the boot logo and keeps restarting.**

✓ **Device turns off unexpectedly and doesn't boot into the system.**

✓ **The phone only boots into Recovery Mode or Fastboot Mode.**

✓ **Certain apps crash immediately, preventing access to the home screen.**

Understanding these issues allows technicians to apply appropriate solutions based on the phone's condition.

Basic Troubleshooting for Boot Loop & Soft-Bricked Phones

1. Reboot the Phone in Safe Mode (For Minor Boot Loops)

If the phone enters a **boot loop due to an app crash,** Safe Mode allows it to boot with only system apps.

Steps to Enter Safe Mode:

1. **Turn off the phone.**

2. **Press and hold the Power button until the manufacturer's logo appears.**

3. **Press and hold the Volume Down button** until the home screen appears with "Safe Mode" in the bottom corner.

4. **Uninstall recently installed apps** that may be causing the issue.

✓ **Outcome:** The phone boots successfully after removing the problematic app.

---

2. Wipe Cache Partition (For Corrupted System Cache)

A corrupted cache can cause **system instability and boot loops**. Clearing the cache can fix the issue without deleting personal data.

Steps to Wipe Cache Partition:

1. **Boot the phone into Recovery Mode:**

   o Press **Power + Volume Up + Home (Samsung)** or **Power + Volume Down (Other Androids)**.

2. **Select 'Wipe Cache Partition' using the Volume buttons and confirm with Power.**

3. **Reboot the device.**

✓ **Outcome:** If the issue was due to a corrupted cache, the phone will boot normally.

---

3. Factory Reset (For Persistent Boot Loops)

A factory reset erases all user data but restores the phone to a working state.

Steps to Perform a Factory Reset:

1. **Enter Recovery Mode** (Power + Volume Up).

2. **Select 'Wipe Data/Factory Reset'** and confirm.

3. **Reboot the phone after the reset.**

✓ **Outcome:** The phone will restart as if it were new, resolving software corruption.

ADVANCED SOLUTIONS FOR SOFT-BRICKED PHONES

1. Flashing Stock Firmware Using Odin (Samsung Phones)

For Samsung devices, flashing stock firmware using **Odin** can restore a soft-bricked phone.

Steps to Flash Firmware with Odin:

1. **Download the official firmware (.tar.md5) for the device.**

2. **Boot the phone into Download Mode (Power + Volume Down + Home/Bixby).**

3. **Connect the phone to a PC and open Odin.**

4. **Load the firmware in the AP, BL, CP, and CSC fields.**

5. **Click 'Start' to begin flashing.**

6. **Wait for the device to reboot with stock firmware.**

✓ **Outcome:** The Samsung phone is fully restored.

---

2. Flashing Firmware Using SP Flash Tool (MediaTek Phones)

MediaTek devices can be revived by flashing firmware using **SP Flash Tool**.

Steps to Flash Firmware with SP Flash Tool:

1. **Download SP Flash Tool and the stock firmware (Scatter File).**

2. **Extract the firmware and load the Scatter File in SP Flash Tool.**

3. **Click 'Download' and connect the phone in Flash Mode.**

4. **Wait for flashing to complete and reboot the device.**

✓ **Outcome:** The MediaTek phone is successfully restored.

---

3. Using ADB Commands for Boot Repair (For Advanced Users)

If a boot loop is caused by **corrupt system files,** ADB (Android Debug Bridge) commands can repair the issue.

Steps to Fix a Boot Loop Using ADB:

1. **Enable Developer Mode and USB Debugging (if accessible).**

2. **Connect the phone to a PC and open the command prompt.**

3. **Enter the following command to restart the system UI:**

4. adb reboot recovery

5. **If necessary, sideload an official firmware update:**

6. adb sideload update.zip

✓ **Outcome:** The phone boots normally after repairing system files.

CASE STUDY: RESOLVING A BOOT LOOP AFTER A FAILED UPDATE

Scenario:

A technician receives a **Samsung Galaxy S10** that is stuck in a **boot loop after an incomplete update**. The phone **does not boot past the Samsung logo** but can enter **Recovery Mode**.

Solution:

1. **Attempted a cache wipe in Recovery Mode – issue persists.**

2. **Performed a factory reset – the boot loop still occurs.**

3. **Flashed stock firmware using Odin.**

4. **Phone rebooted successfully with a fresh system installation.**

✓ **Result:** The Samsung device was restored without data loss from the SD card.

Comparison of Boot Loop & Soft-Brick Solutions

Issue	Cause	Solution
Boot Loop	Corrupt cache, faulty apps	Safe Mode, Wipe Cache Partition
Soft-Bricked Phone	Incomplete flashing, bad ROM	Reflash Stock Firmware, Factory Reset
Stuck in Recovery Mode	Failed update, corrupted partitions	ADB Commands, Flash ROM
Fastboot Loop	Modified bootloader or custom ROM issues	Restore bootloader using Fastboot Mode

---

Exercise

1. **What is the difference between a boot loop and a soft-bricked phone?**

2. **List three causes of a boot loop issue.**

3. **How can Safe Mode help fix a boot loop?**

4. **Describe the process of flashing a MediaTek phone using SP Flash Tool.**

5. **Why is Odin required for flashing Samsung Exynos devices?**

CONCLUSION

✓ **Boot loops and soft-bricking issues occur due to software corruption, failed updates, and flashing errors.**

✓ **Safe Mode, cache wipes, and factory resets can resolve minor boot loops.**

✓ **Flashing stock firmware using Odin, SP Flash Tool, or Fastboot is essential for restoring soft-bricked devices.**

✓ **Understanding these repair techniques helps technicians recover mobile devices efficiently and restore full functionality.**

ASSIGNMENT 2:

✔ PERFORM A STOCK FIRMWARE FLASH ON A TEST MOBILE DEVICE AND DOCUMENT THE PROCESS.

✔ CREATE A TROUBLESHOOTING GUIDE FOR FIXING BOOT LOOP ISSUES

SOLUTION: PERFORM A STOCK FIRMWARE FLASH ON A TEST MOBILE DEVICE AND DOCUMENT THE PROCESS

Introduction

Flashing stock firmware is a process of reinstalling the original operating system on a mobile device. It is commonly performed to **fix boot loops, unbrick devices, remove malware, or restore factory settings**. This guide provides a **step-by-step procedure** to flash stock firmware on different types of chipsets: **Qualcomm (Snapdragon), MediaTek (MTK), and Exynos (Samsung).**

Step 1: Identify the Device Chipset & Download Required Files

Before flashing, determine the **chipset (Qualcomm, MediaTek, or Exynos)** of the device to select the correct flashing tool.

✓ **Find the chipset information:**

- Check the phone's box or use apps like **CPU-Z** or **AIDA64**.

- Search online for the model number to identify the processor.

✓ **Download the Required Files:**

- **Stock Firmware**: Official firmware from the manufacturer's website.

- **USB Drivers**: Required for the flashing tool to detect the device.

- **Flashing Tool**: Specific to the chipset (QPST, SP Flash Tool, Odin, etc.).

- **Bootloader Unlock Tool** (if necessary).

Chipset	Flashing Tool	Firmware Format
Qualcomm (Snapdragon)	QPST, Mi Flash Tool	.mbn, .img
MediaTek (MTK)	SP Flash Tool	Scatter (.txt)
Exynos (Samsung)	Odin	.tar.md5

Step 2: Prepare the Mobile Device for Flashing

✓ **Charge the phone to at least 50% to avoid shutdown during flashing.**

✓ **Backup important data** (as flashing wipes all personal files).

✓ **Enable Developer Options & USB Debugging (if accessible):**

- Go to **Settings → About Phone → Tap 'Build Number' 7 times**.

- Navigate to **Settings → Developer Options → Enable USB Debugging**.
  ✓ **Unlock Bootloader (If Required):**

- Some devices require an unlocked bootloader before flashing.

- Use **fastboot commands** or manufacturer unlock tools.

Step 3: Boot the Device into Flash Mode

Different devices require **specific key combinations** to enter flash mode.

✓ **For Qualcomm Devices (EDL Mode/Fastboot Mode):**

- **EDL Mode:** Hold **Volume Up + Volume Down + Connect USB cable**.

- **Fastboot Mode:** Hold **Power + Volume Down** and connect to a PC.

✔ **For MediaTek (Preloader Mode):**

- Power off the phone.

- Hold **Volume Down or Volume Up** and connect it to the PC via USB.

✔ **For Samsung Exynos (Download Mode):**

- Power off the phone.

- Hold **Volume Down + Bixby + Power** until Download Mode appears.

Step 4: Flash Stock Firmware Using the Correct Tool

Flashing Stock Firmware on Qualcomm Devices Using QPST

1. **Install Qualcomm USB Drivers & QPST Tool on PC.**

2. **Extract the downloaded stock firmware (.mbn file).**

3. **Launch QFIL (Qualcomm Flash Image Loader) inside QPST.**

4. **Connect the phone in EDL Mode.**

5. **Load the Firmware:**

   o Click **Browse → Select Programmer Path (.mbn file).**

6. **Start the Flashing Process:**

o   Click **Download** to flash the firmware.

7. **Wait for Completion:**

o   The device will reboot after a successful flash.

✓ **Outcome:** The Qualcomm device boots up with fresh stock firmware.

Flashing Stock Firmware on MediaTek Devices Using SP Flash Tool

1. **Install MediaTek USB Drivers & SP Flash Tool on PC.**

2. **Extract the Stock Firmware (Scatter File).**

3. **Launch SP Flash Tool and Load the Scatter File.**

4. **Select Download Only Mode & Click Start.**

5. **Power Off the Device and Connect in Preloader Mode.**

6. **Wait for Flashing to Complete.**

7. **Reboot the Phone.**

✓ **Outcome:** The MediaTek phone is restored to factory firmware.

Flashing Stock Firmware on Samsung Devices Using Odin

1. **Download Odin & Samsung USB Drivers.**

2. **Extract the Stock Firmware (.tar.md5 format).**

3. **Launch Odin and Load Firmware Files:**

o   **AP, BL, CP, and CSC (for full firmware).**

4. **Boot Phone into Download Mode & Connect to PC.**

5. **Click Start to Begin Flashing.**

6. **Wait for Odin to Show 'PASS' & Reboot.**

✓ **Outcome:** The Samsung Exynos phone boots up with stock firmware.

Step 5: Verify Successful Flashing & Restore Data

✓ **Check if the phone boots correctly into the stock operating system.**

✓ **Verify IMEI and Network connectivity to ensure no baseband issues.**

✓ **Restore personal data and reinstall necessary applications.**

CASE STUDY: RESTORING A BRICKED PHONE USING STOCK FIRMWARE FLASH

Scenario:

A technician receives a **Xiaomi Redmi Note 10 (Qualcomm Snapdragon 678)** that is stuck on a boot loop after a failed software update. The device does not boot normally but can enter **Fastboot Mode**.

Solution:

✓ **Step 1:** Download the **official MIUI firmware** and **Mi Flash Tool**.
✓ **Step 2:** Boot the device into **Fastboot Mode** (Power + Volume Down).
✓ **Step 3:** Connect the phone to the PC and launch **Mi Flash Tool**.

✓ **Step 4:** Load the **Fastboot ROM (.tgz file)** and click **Flash**.

✓ **Step 5:** Wait for flashing to complete and reboot the phone.

✓ **Result:** The Xiaomi phone boots successfully with factory firmware, fixing the boot loop issue.

Exercise

1. **What is the purpose of flashing stock firmware on a mobile device?**

2. **List the three main chipsets used in smartphones and their respective flashing tools.**

3. **Describe the process of booting a Samsung phone into Download Mode.**

4. **How does SP Flash Tool work for MediaTek devices?**

5. **What precautions should be taken before flashing stock firmware?**

CONCLUSION

✓ Flashing stock firmware is a critical troubleshooting technique for repairing mobile devices.

✓ Different chipsets require specific tools: QPST for Qualcomm, SP Flash Tool for MediaTek, and Odin for Samsung Exynos.

✓ Bootloader unlocking may be required before flashing firmware.

✓ After flashing, verifying IMEI, network connectivity, and system functionality is essential.

TROUBLESHOOTING GUIDE FOR FIXING BOOT LOOP ISSUES

Introduction

A **boot loop** occurs when a mobile device repeatedly restarts without reaching the home screen. This issue is caused by **software corruption, failed updates, custom ROM installation errors, or incompatible apps**. Boot loops can be fixed using **basic troubleshooting methods or advanced flashing techniques** depending on the severity of the issue.

This guide provides **step-by-step troubleshooting solutions** for resolving boot loop problems on Android devices using **Safe Mode, Recovery Mode, Factory Reset, and Flashing Firmware**.

Step 1: Identify the Cause of the Boot Loop

Before proceeding with troubleshooting, determine **the root cause** of the boot loop:

✓ **Did the issue occur after installing an app?**
✓ **Was a system update interrupted?**
✓ **Did the user modify system files (rooting, custom ROM)?**
✓ **Is the phone stuck at the logo without restarting?**

Understanding the cause helps in choosing the most effective fix.

Step 2: Try Rebooting into Safe Mode (For Minor Boot Loops)

If the boot loop is caused by **a third-party app,** booting into Safe Mode can **disable non-system apps,** allowing the device to start normally.

Steps to Enter Safe Mode:

1. **Turn Off the Phone** (If not turning off, press and hold the Power button until the device powers down).

2. **Press and Hold the Power Button** until the manufacturer's logo appears.

3. **Immediately Press & Hold the Volume Down Button** until the home screen appears.

4. **The device will start in Safe Mode (You'll see 'Safe Mode' at the bottom of the screen).**

5. **Uninstall the recently installed apps** that may be causing the issue.

6. **Restart the phone normally to check if the boot loop is resolved.**

✔ **Outcome:** If the issue was caused by an app, the phone will boot successfully after removal.

Step 3: Wipe Cache Partition (For System Corruption)

A corrupted **system cache** can prevent the OS from booting properly. Wiping the cache partition can fix the boot loop without deleting personal data.

Steps to Wipe Cache Partition in Recovery Mode:

1. **Boot into Recovery Mode:**

   o **Samsung:** Power + Volume Up + Home/Bixby

   o **Other Androids:** Power + Volume Up

2. **Navigate to 'Wipe Cache Partition' using the Volume buttons.**

3. **Confirm selection using the Power button.**

4. **Wait for the process to complete, then select 'Reboot System Now'.**

✓ **Outcome:** If the issue was due to corrupted cache files, the phone will boot normally.

Step 4: Perform a Factory Reset (If Cache Wipe Fails)

If the boot loop persists, performing a **factory reset** may be necessary. This will erase **all user data**, so it should only be used if other methods fail.

Steps to Perform a Factory Reset:

1. **Boot into Recovery Mode (Power + Volume Up).**

2. **Select 'Wipe Data/Factory Reset'.**

3. **Confirm the reset and wait for the process to finish.**

4. **Reboot the phone after the reset.**

✓ **Outcome:** The phone will start as a new device, resolving software corruption issues.

Step 5: Flash Stock Firmware (For Severe Boot Loops & Custom ROM Errors)

If a **factory reset does not work**, the boot loop may be due to a corrupted OS or a failed **custom ROM installation**. In such cases, flashing the stock firmware is the best solution.

Flashing Stock Firmware Based on Chipset

Chipset	Flashing Tool	Boot Mode Required	Firmware Format
Qualcomm (Snapdragon)	QPST, Mi Flash Tool	EDL Mode, Fastboot Mode	.mbn, .img
MediaTek (MTK)	SP Flash Tool	Preloader Mode	Scatter (.txt)
Exynos (Samsung)	Odin	Download Mode	.tar.md5

Flashing Stock Firmware Using SP Flash Tool (For MediaTek Devices)

1. **Download SP Flash Tool & Stock Firmware (Scatter File).**

2. **Install MediaTek USB Drivers on PC.**

3. **Extract the Firmware and Load the Scatter File in SP Flash Tool.**

4. **Click 'Download Only' and Connect the Phone in Flash Mode.**

5. **Wait for Flashing to Complete and Reboot the Device.**

✓ **Outcome:** The MediaTek device boots into the stock OS, fixing the boot loop.

Flashing Stock Firmware Using Odin (For Samsung Devices)

1. **Download Odin & Samsung Stock Firmware (.tar.md5).**

2. **Boot the Phone into Download Mode (Power + Volume Down + Bixby).**

3. **Launch Odin and Load the Firmware Files (AP, BL, CP, CSC).**

4. **Click 'Start' to Begin Flashing.**

5. **Wait for Odin to Show 'PASS' & Reboot the Phone.**

✓ **Outcome:** The Samsung phone is restored with the stock OS.

CASE STUDY: FIXING A BOOT LOOP AFTER A FAILED UPDATE

Scenario:

A technician receives a **Redmi Note 10 (Qualcomm Snapdragon 678)** that is stuck in a **boot loop after an incomplete update**. The phone **only boots into Fastboot Mode** but does not start normally.

Solution:

✓ **Step 1:** Download the **official MIUI firmware** and **Mi Flash Tool**.
✓ **Step 2:** Boot the device into **Fastboot Mode** (Power + Volume Down).
✓ **Step 3:** Connect the phone to a PC and launch **Mi Flash Tool**.
✓ **Step 4:** Load the **Fastboot ROM (.tgz file)** and click **Flash**.
✓ **Step 5:** Wait for flashing to complete and reboot the phone.

✓ **Result:** The Redmi Note 10 successfully boots into the stock MIUI system, fixing the boot loop.

Comparison of Boot Loop Fixing Methods

Method	When to Use	Effectiveness
Safe Mode	If an app is causing the issue	High
Wipe Cache Partition	If system cache is corrupted	Moderate
Factory Reset	If settings or system files are corrupt	High
Flashing Stock Firmware	If system files are missing or modified	Very High

Exercise

1. **What are the common causes of a boot loop issue?**

2. **List two methods to fix a boot loop without flashing firmware.**

3. **Describe the process of wiping the cache partition in Recovery Mode.**

4. **What flashing tool is used for Samsung Exynos devices?**

5. **Why is Safe Mode useful for fixing a boot loop?**

CONCLUSION

✓ **Boot loops occur due to software corruption, failed updates, and flashing errors.**

✓ **Safe Mode and wiping cache partition can fix minor boot loop issues.**

✓ **Factory resetting the device can resolve persistent boot loops.**

✓ **Flashing stock firmware is the best solution for severe boot loop cases.**

✓ **Understanding these troubleshooting methods allows technicians to restore devices efficiently.**