**Document Analysis: 289. Boot Issues Notes**  
**CompTIA A+ 220-1102 Exam – Core 2 | Domain 3.0: Software Troubleshooting**  
**Objective Covered: Objective 3.1 – Troubleshoot common Windows operating system problems**

**Professional Breakdown of Key Concepts & Boot Troubleshooting Procedures**

**🔹 1. Boot Process Overview**

**Firmware Initialization**

* System starts using firmware: either **BIOS (Basic Input Output System)** or **UEFI (Unified Extensible Firmware Interface)**.
* Executes a **POST (Power-On Self-Test)** to validate hardware integrity.
* Identifies the **boot device** (HDD, SSD, USB, etc.) from which the OS should be loaded.

**BIOS Boot Process**

* **BIOS** Looks for a **Master Boot Record (MBR)** in the **first sector** of the boot device.
* **MBR** identifies the **bootloader**, typically **bootmgr.exe** for Windows.
  + This is the boot manager.
* **Boot manager** will then be able to read the **Boot Configuration Data (BCD)** file is read by the boot manager.
  + **From this file it can identify which OS are installed on the computer including windows and other OS such as Linux.**
* Boot manager then identifies installed operating systems and loads **winload.exe**, the Windows Boot Loader.
  + This is stored in the **system root folder** of the boot partition.
  + Winload is going to boot up the Windows System.
* Then the OS boot process loads:
  + **Kernel**
  + **HAL (Hardware Abstraction Layer)**
  + **Boot device drivers**
  + Hands control to the kernel, which initiates the **Windows login screen**.

**UEFI Boot Process**

* Uses **GUID Partition Table (GPT)** instead of MBR.
* Microsoft folder underneath the EFI directory that is a located off the root of the storage device.
  + This will contain the BCD and the bootmgrfw.efi file.
* Reads the **EFI system partition**, which contains:
  + **bootmgrfw.efi** – UEFI Boot Manager
  + **BCD** – Boot Configuration Data File
    - **Shows a boot menu**
    - **Or load up a single OS depending on I you’re using a dual boot OS or a single OS.**
* Locates **winload.efi**, the UEFI equivalent of the Windows Boot Loader loading:
  + **Kernel**
  + **HAL (Hardware Abstraction Layer)**
  + **Boot device drivers**
  + Hands control to the kernel, which initiates the **Windows login screen**.
* Boot continues similarly with kernel, HAL, and drivers loaded before login prompt.

**🔹 2. Common Boot Issues**

**A. Failure to Boot or Invalid Boot Disk**

**Symptoms:**

* System shows an error like “Invalid Boot Disk” or fails to proceed past BIOS.

**Causes:**

* Incorrect boot order in BIOS/UEFI (e.g., USB or DVD drive prioritized over internal SSD/HDD).
* External bootable media present (e.g., USB, CD/DVD).
* Damaged boot device or corrupted MBR/GPT.

**Solutions:**

* **Temporary Fix:** Remove external media before boot.
* **Permanent Fix:** Access BIOS/UEFI → Set internal drive (HDD/SSD) as the first boot device.

**B. No Operating System Found**

**Symptoms:**

* System displays: “No OS Found”.

**Causes:**

* Boot device lacks valid OS installation.
* Missing or damaged MBR/GPT.
* BCD is misconfigured or missing.

**Resolution Steps:**

1. Ensure an operating system is properly installed.
2. Verify the drive contains either an MBR (for BIOS) or GPT (for UEFI).
3. Use **Startup Repair tool** to open up the recovery command prompt.
4. Utilize **bootrec** commands from command prompt:
   * **bootrec /fixmbr** – Repairs the MBR (BIOS systems only).
   * **bootrec /fixboot** – Repairs the boot sector (UEFI systems).
   * **bootrec /rebuildbcd** – Used to add missing windows installations to the BCD.
5. Use **diskpart** to mark the correct partition as **active**:
   * If no partition is marked active, the OS won’t load.

**C. Graphical Interface Fails to Load / Black Screen**

**Symptoms:**

* System boots to a black screen or fails to reach Windows login.

**Possible Causes:**

* Corrupted or incompatible **graphics driver**.
* System file corruption or malware.
* Hardware fault (GPU or display connection failure).

**Troubleshooting Steps:**

1. **Safe Mode Boot:**
   * If accessible, uninstall and reinstall the graphics driver.
2. **No GUI Access:**
   * System may require repair, recovery, or complete OS reinstall.
3. **Use Keyboard Shortcut:**
   * Press **Windows + Ctrl + Shift + B**:
     + If you hear a beep → system is responsive → graphical component failed.
     + No beep → system freeze; further troubleshooting is required.

**Recommended Tools:**

* **chkdsk** – Scans and repairs file system issues on the drive.
* **sfc /scannow** – Checks for and repairs corrupt or missing system files.

**🔹 3. Command Line Tools for Boot Repair**

**Essential Commands to Memorize for Exam and Field Use:**

| **Command** | **Use Case** |
| --- | --- |
| bootrec /fixmbr | Repairs MBR boot sector (for BIOS systems only) |
| bootrec /fixboot | Repairs boot sector (for UEFI/GPT systems) |
| bootrec /rebuildbcd | Rebuilds Boot Configuration Data (BCD) |
| diskpart | Accesses partitioning tool to mark system partition active |
| chkdsk | Repairs drive-level corruption |
| sfc /scannow | Verifies system file integrity |

**🔹 4. Summary of Boot Issues & Resolutions**

| **Issue** | **Root Cause** | **Recommended Action** |
| --- | --- | --- |
| Invalid Boot Disk / Failure to Boot | Incorrect boot priority or external media | Remove media or adjust boot order in BIOS |
| No OS Found | OS not installed or damaged boot loader | Install OS, use bootrec & diskpart |
| GUI Fails / Black Screen | Graphics driver issues or system corruption | Boot Safe Mode, reinstall driver, use sfc |

**✅ Real-World Implementation Scenarios**

**Scenario 1: Black Screen on Boot**

* User boots PC → only black screen appears.
* Action: Boot to Safe Mode → reinstall graphics driver.
* If Safe Mode fails: use sfc and chkdsk.

**Scenario 2: Dual Boot Not Detected**

* Windows boots, Linux not shown.
* Action: bootrec /rebuildbcd to rebuild boot menu.

**Scenario 3: New SSD, No OS Installed**

* Error: “No OS Found”
* Action: Confirm OS installation, check for GPT or MBR, run bootrec as needed.

**✅ Exam Inclusion Notification**

✅ **Included in CompTIA A+ 220-1102 Exam Curriculum**  
**Domain:** Core 2 – Software Troubleshooting  
**Objective:** 3.1 – Troubleshoot common Windows OS problems

This document thoroughly addresses one of the most **critical troubleshooting competencies** expected on the A+ 1102 exam. Expect scenario-based questions that test knowledge of:

* Boot processes
* Use of command-line recovery tools
* Identifying system startup failure symptoms
* Resolving driver and graphical interface issues

**✅ Final Study Notes Summary**

* Understand differences between **BIOS + MBR** and **UEFI + GPT** boot sequences.
* Learn the **three major boot failure scenarios**:
  1. Invalid boot disk
  2. No OS found
  3. GUI fails to load
* Memorize bootrec and diskpart command usage.
* Use **Safe Mode** and **keyboard shortcuts** for GUI recovery.
* Apply sfc and chkdsk to verify integrity of system files and drives.
* Always confirm the **active partition** and **boot order** during troubleshooting.

Let me know if you'd like this breakdown exported to a **Word or PDF** study guide or if you wish to analyze the next topic.