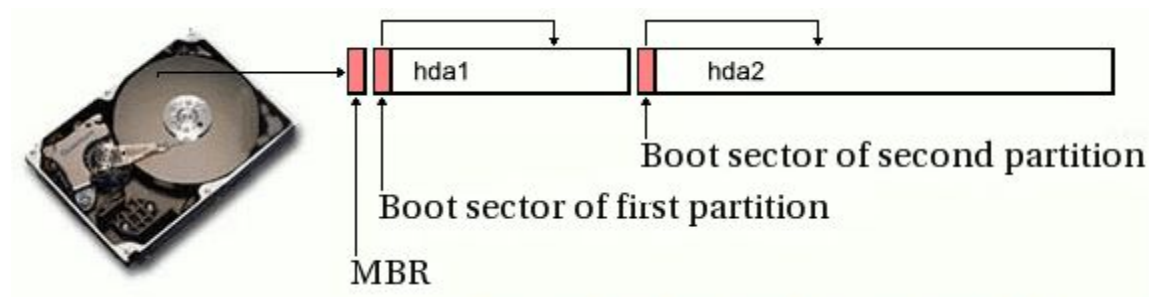


Boot Up Procedure for Windows

1> Power On Self-Test (POST) The computer loads information from Basic Input/Output System (BIOS) and completes basic hardware checks on the CPU, RAM, keyboard, and video. If this check fails, use the POST beep codes and displayed errors to identify the faulty hardware.

When POST completes successfully, it starts the bootstrap loader. Computers can boot from different devices, such as a hard drive, an optical disc, or a USB flash drive. The bootstrap loader is the last part of the BIOS programming that identifies where to look for a bootable operating system.

2> Look For Master Boot Record and Boot Sector - The bootstrap loader looks for bootable media by using the boot order in the BIOS. When booting from a hard drive, it looks for a master boot record (MBR) and passes control to the MBR. Every MBR-based hard drive has a single MBR, and every partition on the hard drive has a single boot sector.



3> A hard drive can have up to four primary partitions, with one partition marked as active. The active partition includes code within the boot sector that identifies the location of files used to start the operating system.

4> The following steps show the boot process from a hard drive:

1. BIOS loads the master boot code from the MBR into memory.
2. The master boot code scans the partition table on the disk, looking for the active partition.
3. The contents of the active partition's boot sector are loaded into memory by the master boot code.
 - A. On Windows XP, the NTLDR file is loaded.
 - B. On Windows Vista, / 7 / 8 / 8.1, the boot manager (bootmgr) is loaded.

Note: Bootable media other than hard disks have a boot sector but do not have an MBR. For example, a floppy disk has only one partition, so it doesn't need an MBR to locate an active partition.

Note: Globally Unique Identifier (GUID) Partition Table (GPT)-based disks are supported on Windows Vista and Windows 7 going forward for systems that use an Extensible Firmware Interface (EFI) instead of a traditional BIOS. The EFI includes an entry to start the bootmgr directly, without looking for an MBR. More later on this.

5> Load System Boot Files on Windows XP

On Windows XP, the system boot files are located at the root of the active partition, which is typically C. They are hidden system files, so you won't see them by default. The boot sector contains the name of the file that loads windows. Every operating system has one file that starts the OS.

Following is a description of what each file does:

- **NTLDR.** This is a small program that loads the Windows operating system based on the contents of the Boot.ini file.
- **Boot.ini.** This text file identifies the disk, partition, and folder where Windows is located. On multiboot systems, it includes locations of different operating systems and specifies a default operating system.
- **Ntdetect.com.** NTLDR starts this to detect system hardware. When NTLDR completes the initial load, it runs the ntoskrnl.exe program from the \ Windows\System32 folder. This starts Windows XP

6> Load Boot Manager on Windows Vista and Windows 7

You might remember seeing that Windows Vista and Windows 7 usually create a 100-MB system partition when they are installed. This provides space for BitLocker to be enabled, includes the Windows Recovery Environment (RE), and is also used for system boot files. The boot sector contains the name of the file that loads windows. Every operating system has one file that starts the OS.

The following system boot files are used on Windows Vista and Windows 7:

- **Boot manager (bootmgr) file.** This is a hidden system file located at the root of the system partition.
- **Boot configuration data (BCD).** The BCD is used instead of the Boot.ini file to identify the location of the operating system. On multiboot systems, it includes information for additional operating systems and a default operating system. It is located in the \boot folder of the system partition. When the bootmgr completes the initial load, it runs Winload.exe from the \Windows\System32 folder. This starts Windows.

Note: NTLDR, Ntdetect.com, Boot.ini, and Ntoskrnl.exe files are used only on Windows XP. On Windows Vista and Windows 7 and going forward, bootmgr, BCD, and Winload.exe are used instead.

Note: [What is the System Reserved Partition and Can You Delete It?](#)

Basically - This partition contains two important things:

- 1> **The Boot Manager and Boot Configuration Data :** When your computer boots, the Windows Boot Manager starts up and reads the boot data from the Boot Configuration Data (BCD) Store. Your computer boots the boot loader off the System Reserved partition, and it boots Windows from your system drive.
- 2> **The startup files used for BitLocker Drive Encryption:** If you ever decide to encrypt your hard drive with BitLocker drive encryption, the System Reserved partition contains the necessary files for starting your computer. Your computer boots the unencrypted System Reserved partition, and it will decrypt the main encrypted drive and boot the encrypted Windows system.

The System Reserved partition consumes 100MB of space on Win7 and 350 MB of space on Win8.

Note: FYI - Viruses attack boot sectors frequently. Re-infects you with every reboot.

FYI - MBR's created by Linux and Windows are identical. But boot sectors are different between the two operating systems.

Points to Remember: Although the MBR and Boot sector are both contained on the hdd, the MBR is NOT contained within the ACTIVE Partition, only the boot sector is part of the ACTIVE Partition. Refer back to the pic of the hdd shown earlier.

Microsoft has set it up where the boot sector is not visible to anyone and is a very complex file. Not typically altered or modified by users, even power users, although you can with certain programs.

These files are always expected to be on C:\

Windows OS always has to have a C:\ to start.

More technically it expects that file to be in the root of c drive.

Microsoft normally hides this file, makes it read only and makes it a system file.

Microsoft also secured this root directory in V/7/8/8.1 against user access. Only admins can access this root directory and make changes. But even admins need to go to folder options and check show hidden file and extensions.

HDD Partition Rules

On one hdd, you create one active partition and then one extended partition.

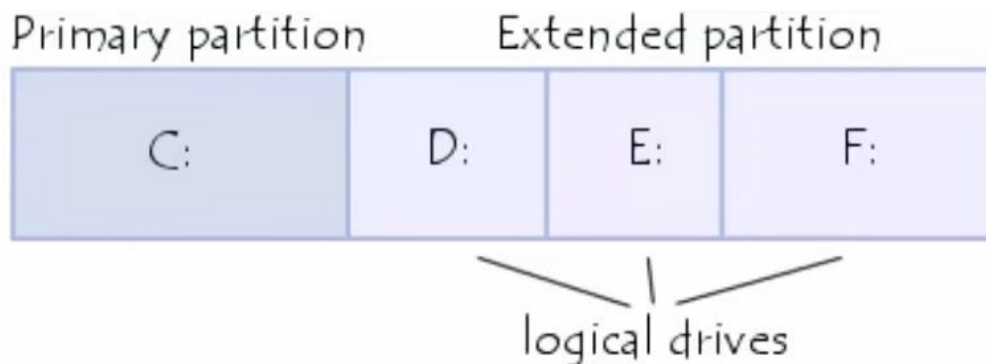
Within this extended partition you can then create logical drives - called D:, E:, F: etc,etc....

You can have up to 4 primary partitions in a system.

You can have only 1 extended partition.

You can have as many logical partitions as space allows.

1 hdd with 4 partitions



Summary of Boot Process For Windows 7 and > Recap Overview

- 1> BIOS looks for MBR (sector 0) and Boot Sector (sector 1 Partition table) of 1st designated boot hdd. Copies this info into RAM and executes the files.
- 2> CPU reads the boot sector file which contains the name of the file (bootmgr) that loads windows. These files are always expected to be in the root of C:\ and marked hidden and system.
- 3> Bootmgr file then reads the BCD.dat file located in the active partition under the directory called "boot" in the root of C:. The BCD.dat file is actually a registry file and replaces the old XP boot.ini file. Contains various locations of important files and settings for other features of Windows.
- 4> BCD then loads the WinLoad.exe file on the boot partition. C:\windows\system32\winload.exe. WinLoad.exe then starts to load drivers to start the Windows kernel. Loads into the memory the Registry hive and some additional drivers marked as BOOT-START. The kernel then passes control, once finished, to the session mgr, SMSS.exe, which initializes the System session and loads/starts all devices and drivers. Here is where you see Windows is Loading screen.
- 5> WinLogon.exe starts the user logon screen, starts services and executes group policy scripts, starts service control mgr. Windows then creates a session for that user.
- 6> Explorer.exe (desktop shell - main interface or GUI between you and Windows) starts and creates the desktop windows mgr (DWM) process and initiates the desktop.
Note: Explorer.exe can be replaced with a virus infected copy and cause havoc with your system - nothing works - very typical. You run a virus scanner and it recognizes the file is different - not the right size or not digitally signed by MS and will try to delete that copy and replace it with an old version stored on the system backup.

Typical boot times with the same hardware.

Windows 7 boot time 44 seconds

Windows 8 boot time 25 seconds (if a UEFI BIOS were used it would have shaved another 8 seconds)

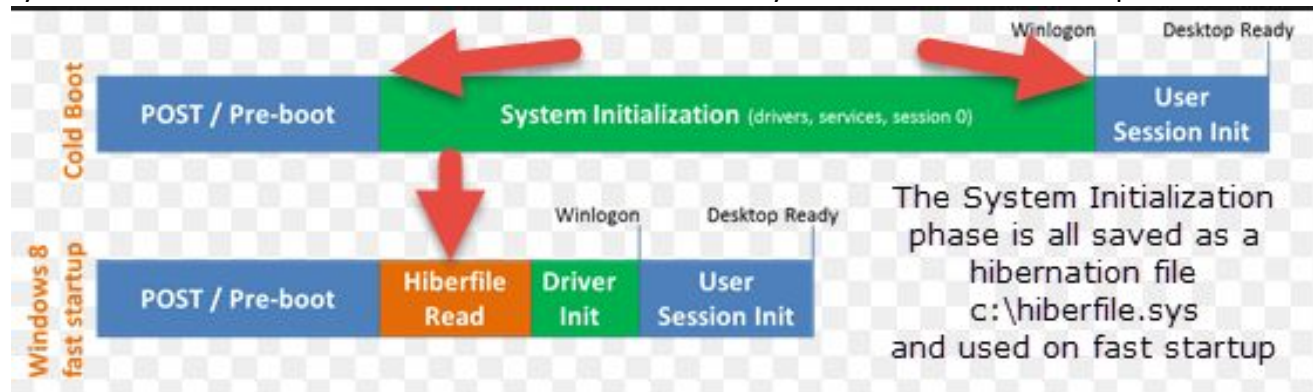
In Windows 8

Microsoft does this by utilizing the hibernation file - hiberfile.sys from c:\

Windows 8 takes a snapshot of the system when you shut down and saves it to the hdd.

It then uses this file on the next boot up, thus saving so initialization time.

System Initialization on cold boot is saved as the hiberfile.sys and used for fast start up.



Initial Startup Phase for EFI Computers

The Unified Extensible Firmware Interface, also known as UEFI (pronounced “oofy” or “U effy”)

UEFI (Unified Extensible Firmware Interface) is a standard firmware interface for PCs, designed to replace BIOS (basic input/output system). This standard was created by over 140 technology companies as part of the **UEFI** consortium back in 2010, including Microsoft.

- 1> Better security by helping to protect the pre-startup—or pre-boot—process against **bootkit** attacks.
- 2> Faster startup times and resuming from hibernation.
- 3> Support for drives larger than 2.2 terabytes (TB).
- 4> Support for modern, 64-bit firmware device drivers that the system can use to address more than 17.2 billion gigabytes (GB) of memory during startup.
- 5> Capability to use BIOS with UEFI hardware.

Note: All 64bit versions of PCs running Windows with a logo from the Windows Certification Program will use UEFI instead of BIOS.

[What You Need to Know About Using UEFI Instead of the BIOS](#)

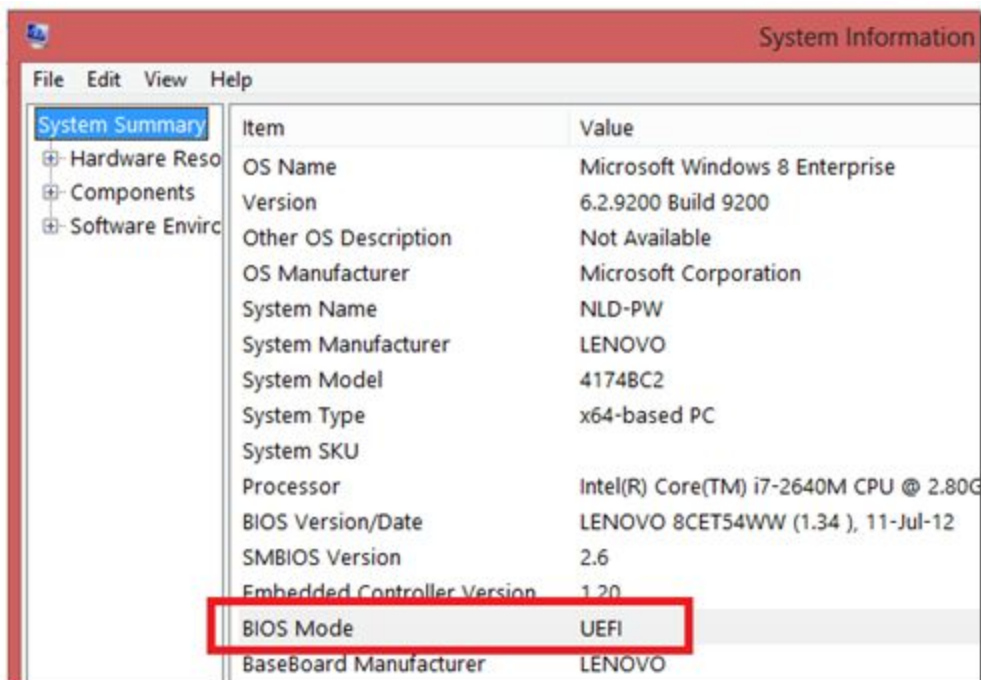
[Learn How UEFI Will Replace Your PC's BIOS](#)

Basically - The MBR is limited to 4 primary partitions per disk and bootable disks are limited in size to 2.2 TB. UEFI uses the GUID Partition Table, which utilizes Globally Unique IDs to address partitions and allows booting from hard disks as large as 9.4 ZB.

Accessing the UEFI (BIOS) setup on a Windows 8 system

1. Press the Windows (■) key + C, or swipe in from the right edge of the screen to open your Charms.
2. Click Settings.
3. Click Change PC Settings.
4. Click Update and recovery, then select Recovery.
5. To the right beneath Advanced Startup, click Restart now.
6. Once the boot menu appears, select Troubleshoot.
7. In the Troubleshoot menu, select Advanced options.
8. In the Advanced options menu, click UEFI Firmware Settings.
9. Click Restart. The system will restart and enter UEFI (BIOS).

You might be wondering if your system is using UEFI or the legacy BIOS, it's easy to check. Just fire up [MSINFO32](#) and look for this entry:



Item	Value
OS Name	Microsoft Windows 8 Enterprise
Version	6.2.9200 Build 9200
Other OS Description	Not Available
OS Manufacturer	Microsoft Corporation
System Name	NLD-PW
System Manufacturer	LENOVO
System Model	4174BC2
System Type	x64-based PC
System SKU	
Processor	Intel(R) Core(TM) i7-2640M CPU @ 2.80G
BIOS Version/Date	LENOVO 8CET54WW (1.34), 11-Jul-12
SMBIOS Version	2.6
Embedded Controller Version	1.20
BIOS Mode	UEFI
BaseBoard Manufacturer	LENOVO

There are two possibilities here, either UEFI or Legacy.

How To Start Windows 8 or 8.1 in Safe Mode

Safe Mode in Windows 8 is accessible from the Startup Settings menu.

What is The Startup Settings Menu?

Startup Settings is a menu of the various ways in which you can start Windows 8, including the well-known diagnostic startup option called *Safe Mode*. The options available from the Startup Settings menu allow you to start Windows 8 in some restricted fashion when it won't start normally.

The Startup Settings is accessible from the **Advanced Startup Options menu**.

The **Advanced Startup Options** menu in Windows 8 is the central fix-it location for the entire operating system. From here you can access Windows 8 diagnostic and repair tools like Refresh Your PC, Reset Your PC, System Restore, Command Prompt, and much more. The Advanced Startup Options menu should appear automatically after two consecutive startup errors.

However, if you need to open it manually, there are different ways to do so as shown below:

How to enable the F8 key to start Safe Mode in Windows 8

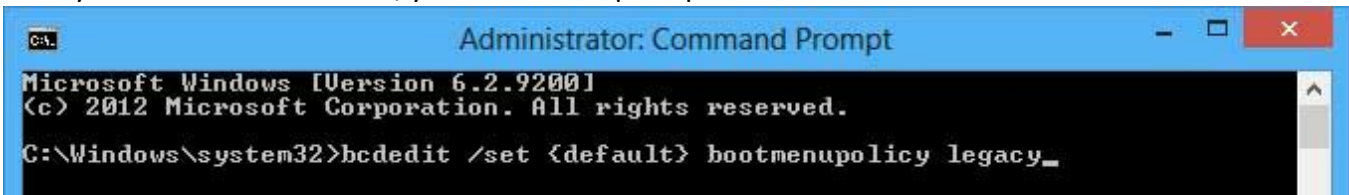
To enable the F8 key in Windows 8 you will first need to open an **elevated command prompt**.

When the elevated command prompt is open you will be at the **C:\Windows\System32>** prompt.

To enable F8 in Windows 8 you need to type the following in the command prompt and then press the **Enter** key.

bcdedit /set {default} bootmenupolicy legacy

Once you enter the above text, your command prompt should look like:

A screenshot of an elevated Windows Command Prompt window. The title bar reads "Administrator: Command Prompt". The window content shows the following text:

```
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.
C:\Windows\system32>bcdedit /set {default} bootmenupolicy legacy_
```

Windows will report that the "The operation completed successfully."

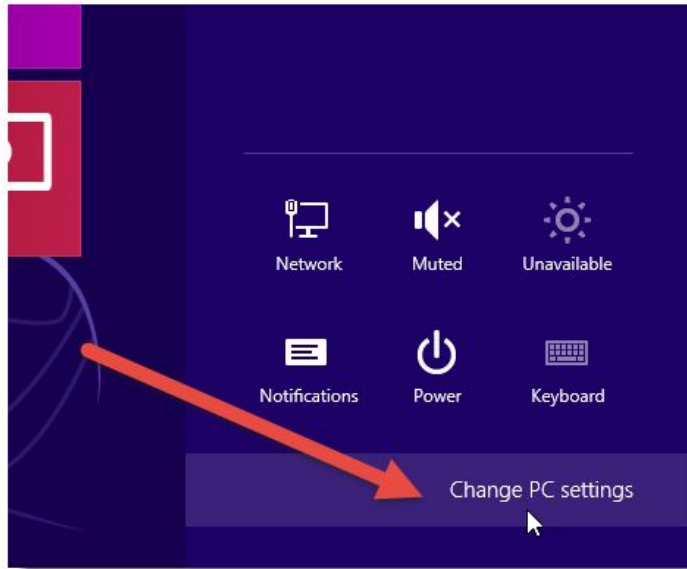
With this settings configured, you can now press **F8** while Windows 8 starts in order to access Safe Mode and other Advanced Boot options.

If you would like to disable the F8 key and go back to the original Windows 8 setting you can open an elevated command prompt and enter the following command:

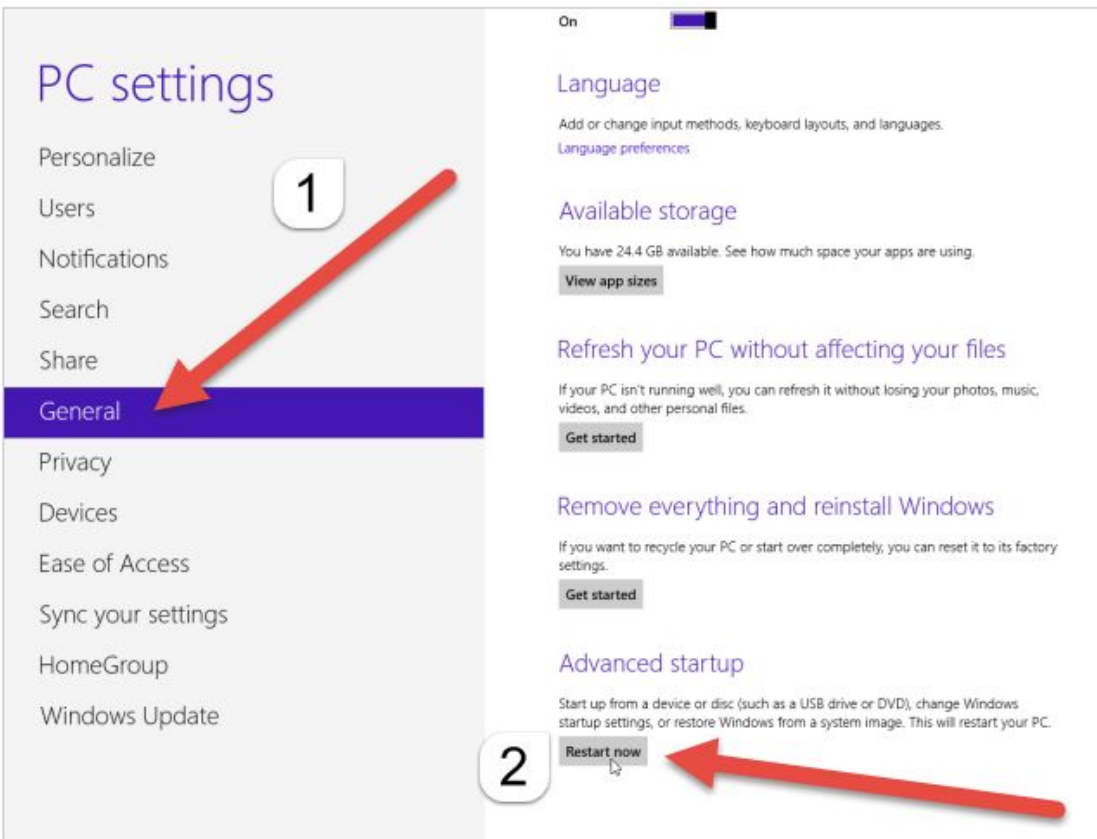
bcdedit /set {default} bootmenupolicy standard

2> Through PC Settings – The Long Way

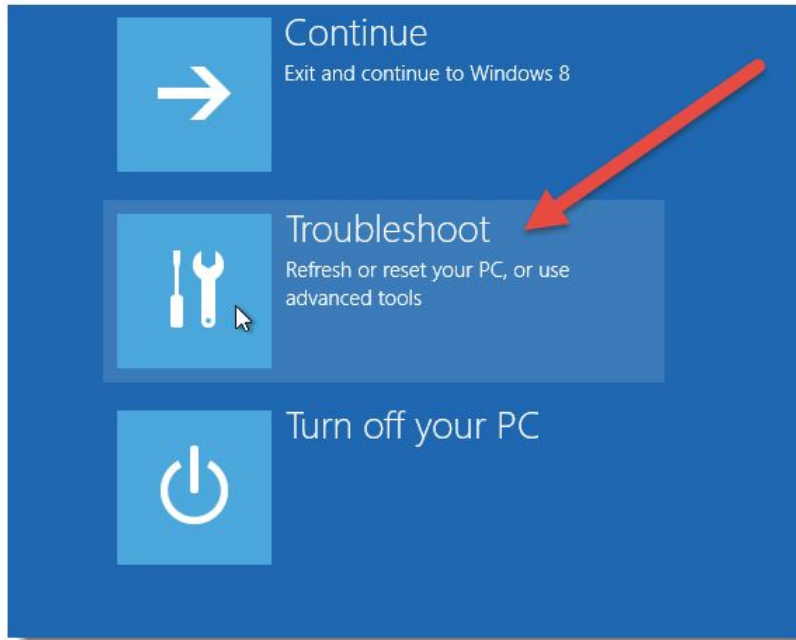
The first and primary method is through the PC Settings. Press the Windows key + I (capital “I”) and click Change PC Settings.



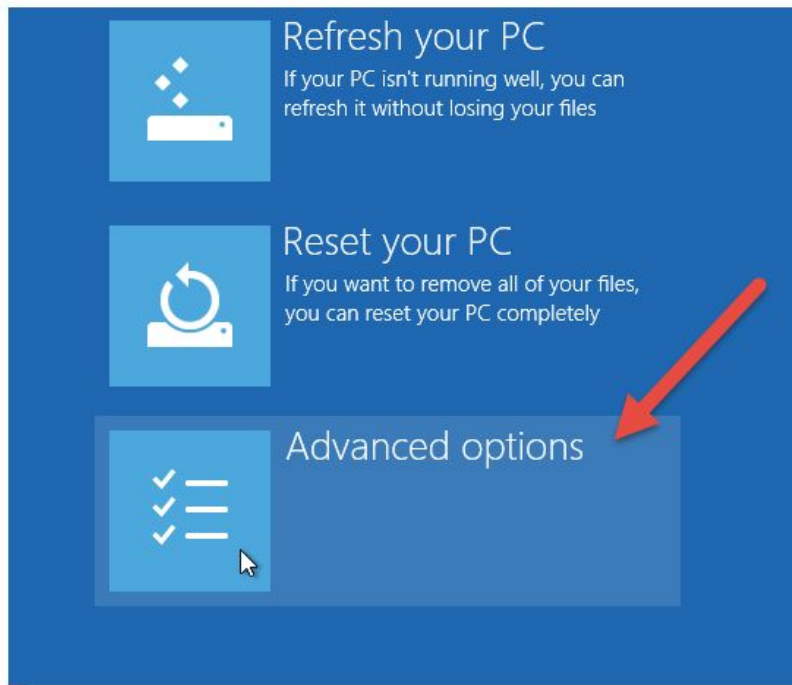
Click the General option on the left and then click Restart now under Advanced Setup. This starts the normal restart process, which gets automatically interrupted as Windows is about to shut down.



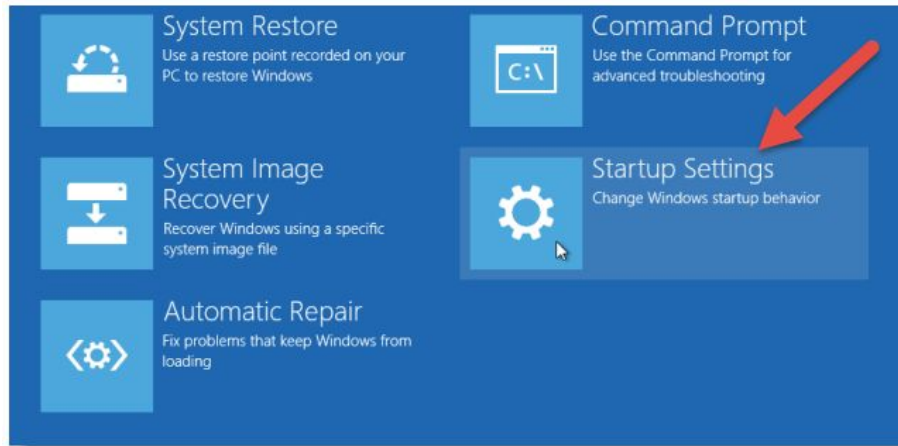
Instead of fully rebooting, the blue boot options menu displays. To access the options for refreshing or resetting your PC or to use the advanced tools, click Troubleshoot.



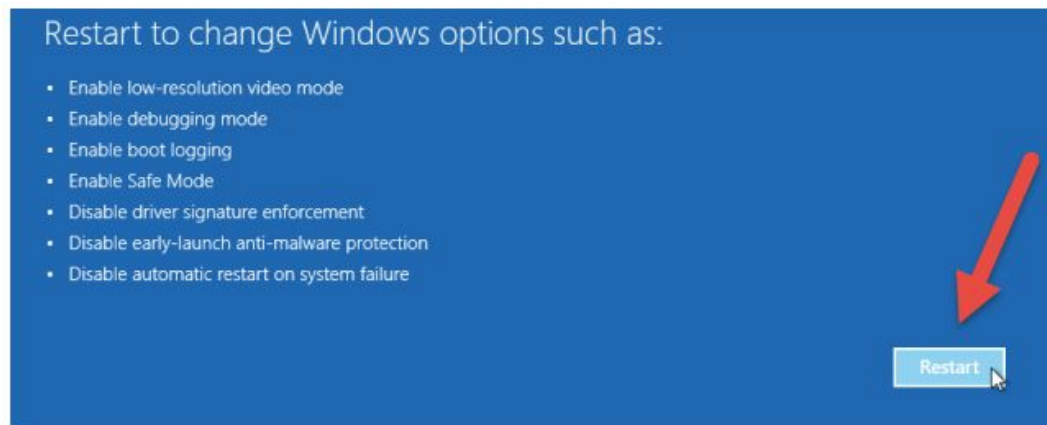
You can choose to Refresh your PC, Reset your PC, or access Advanced options.



The options pictured below are available on the Advanced options menu. To change how Windows starts up, such as booting into safe mode, click Startup Settings

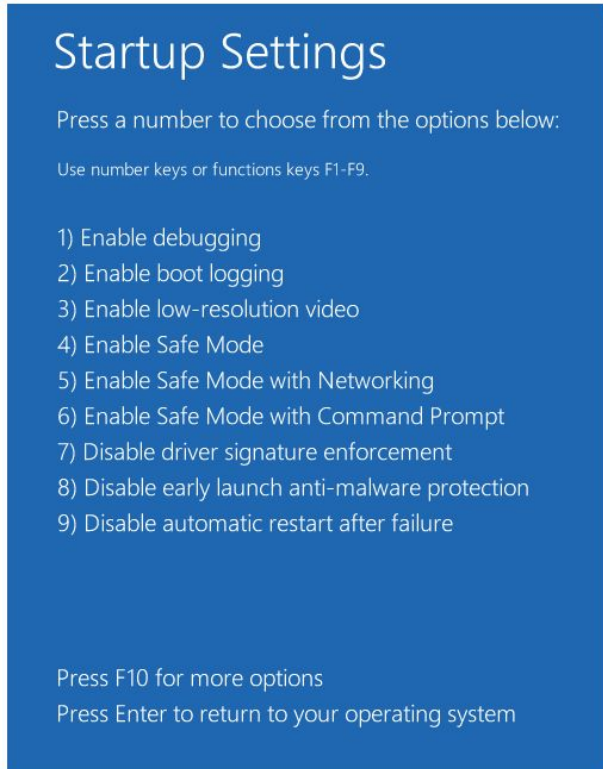


A list displays, showing you the options available when Windows restarts next time. Click Restart to restart Windows and gain access to these options.

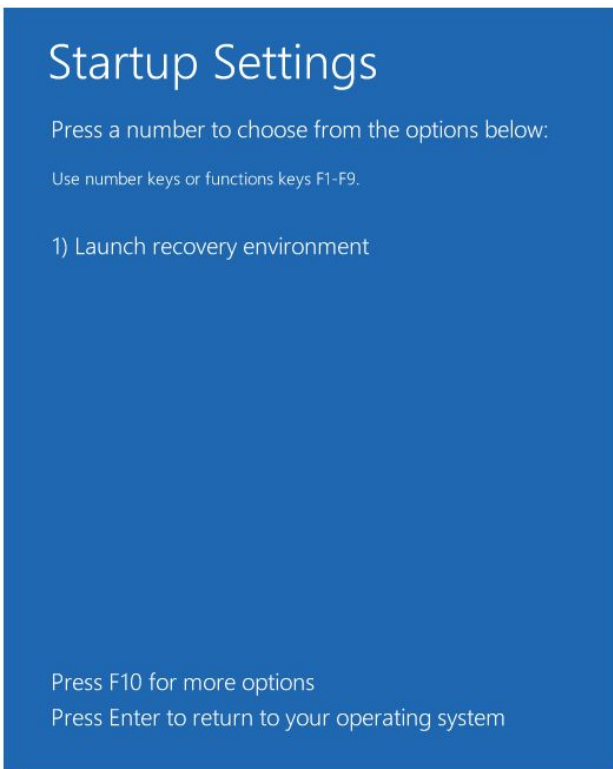


When your PC restarts, the Startup Settings menu displays. Select an option using the number keys or the function keys F1-F9. There is one additional option accessible by pressing F10.

If you decided you don't want to use any of these options, you can boot normally by pressing Enter.

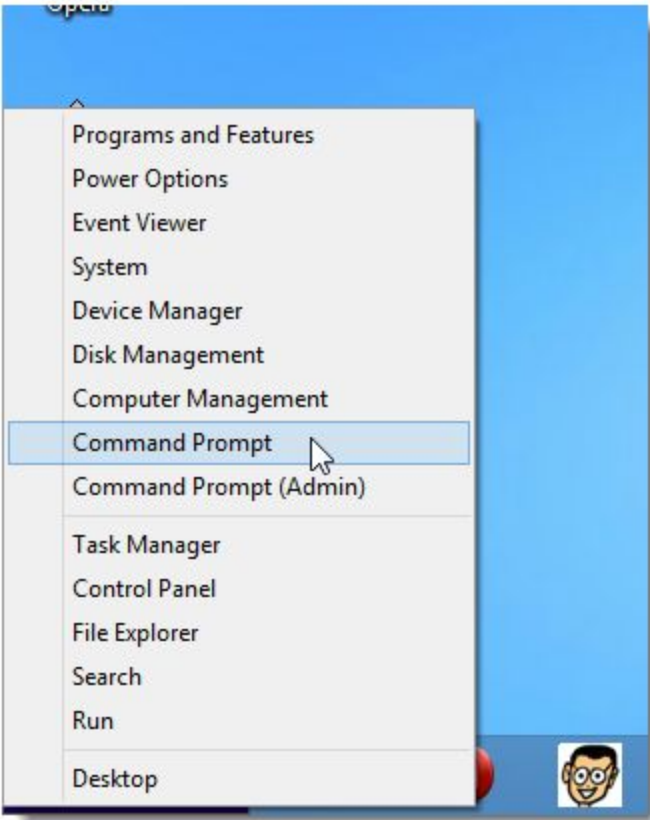


Launch recovery environment is the extra option accessed by pressing F10. To return to the other options, press F10 again



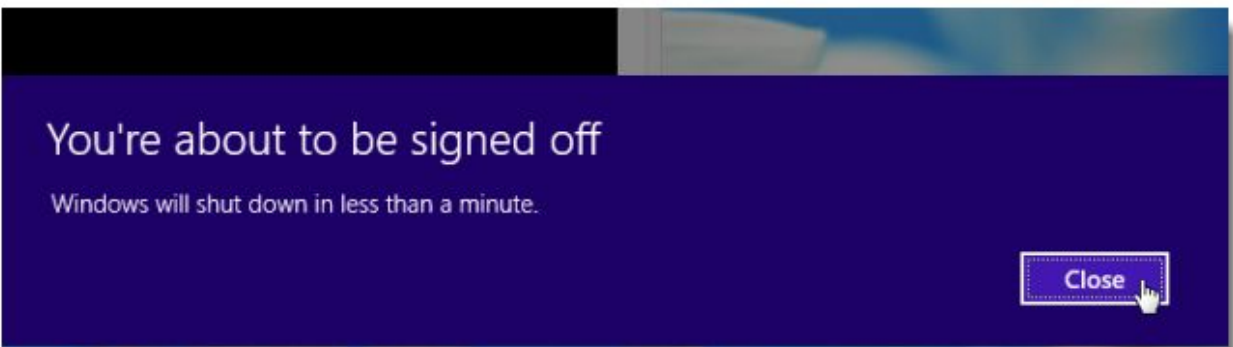
3> OR Through the Command Prompt

1> You can also press Win + X to access this menu.



2> Type the following command at the prompt and press Enter.
`shutdown.exe /r /o`

3> A message displays in the middle of the screen warning you that you are about to be signed off. Windows will reboot automatically.



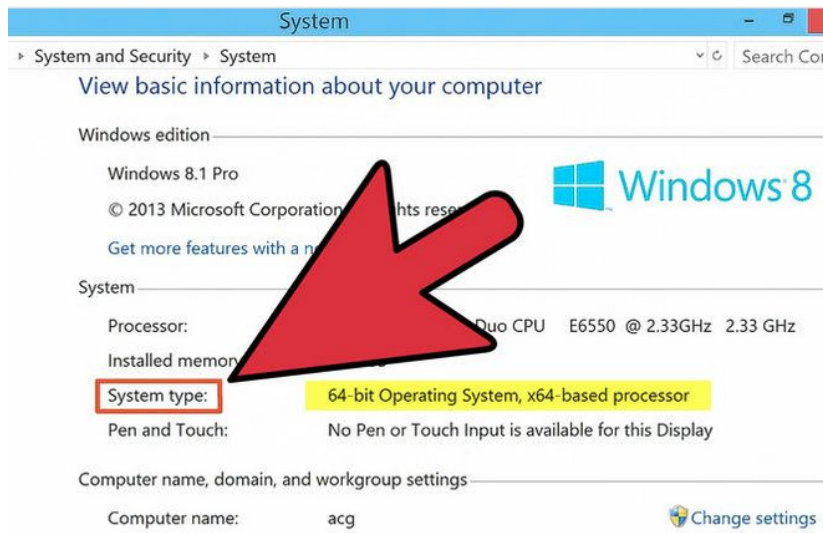
Windows 8 now includes the “automatic restart after failure” feature, which detects whether the OS loaded successfully, If not, the system automatically reboots into the boot options menu, allowing you to access the troubleshooting options.

How To Tell if You Have Windows 8 64-bit or 32-bit

The two major editions of Windows 8, Windows 8 (standard) and Windows 8 Pro, can each come in either 64-bit or 32-bit format. Knowing which type of Windows 8 you have is important so you choose the correct drivers and software for your operating system.

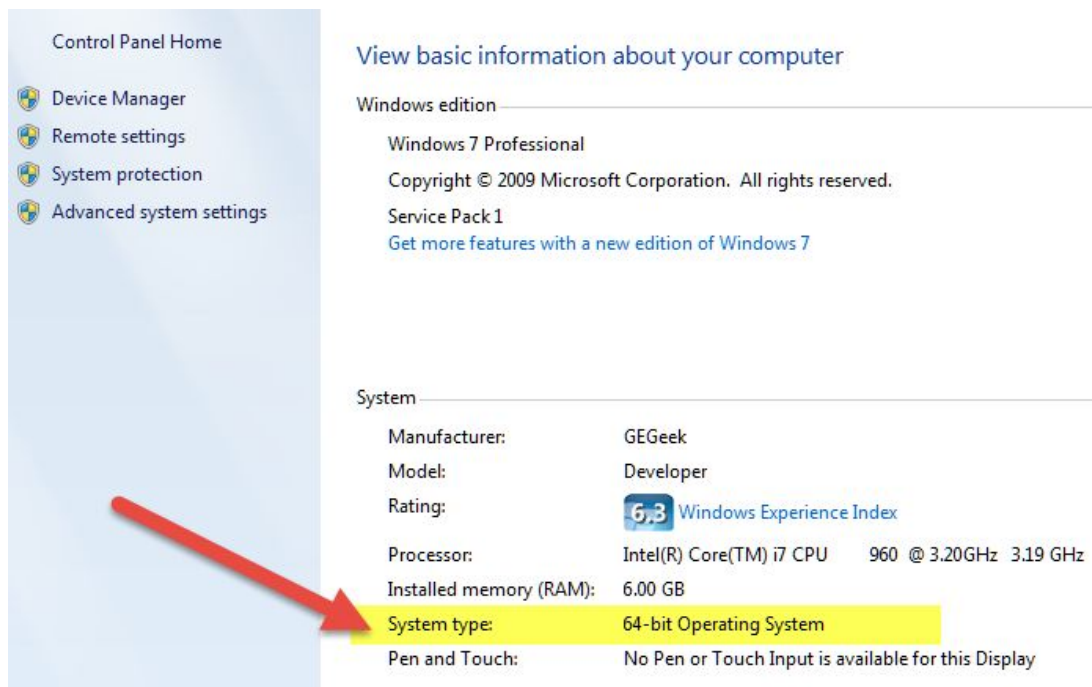
Method 1 Windows 8

- 1> **Open the Power User menu.** Press **Win+X** to open this menu. Click on System.
- 2> **Look for System Type.** This is located under the System heading. It will say either 32-bit Operating System or 64-bit Operating System.



Method 2 Windows XP/Vista/7

- 1> Right click My Computer and select properties



Repairing Windows 8 Options

- 1> **Refreshing your PC** reinstalls Windows and keeps your personal files and settings. Also keeps the apps that came with your PC and the apps you installed from the Windows Store
[How to Refresh Windows 8 and Windows 8.1](#)
- 2> **Resetting your PC** reinstalls Windows but deletes your files, settings, and apps except for the apps that came with your PC.
[How to Reset Windows 8 and Windows 8.1](#)
- 3> **Restoring your PC** is a way to undo recent system changes you've made
[How to Do a System Restore in Windows 8 and 8.1](#)

How to Refresh, Reset or Restore your PC – From Microsoft

[Refresh your PC without affecting your files](#)

[Remove everything and reinstall Windows](#)

[Restore your PC to an earlier point in time](#)

Windows 8 System Restore Guide

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Related Tutorials

[How to Create a Recovery Image used to Reset Windows 8 or 8.1](#)

[How to Show Location of Recovery Image used to Reset Windows 8 or 8.1](#)

[How to Boot to the "System Recovery Options" in Windows 8](#)

[How to Create a Recovery PC settings Shortcut in Windows 8.1](#)

[How to Do a Clean Install of Windows 8 or Windows 8.1](#)

[How to Do a Repair Install of Windows 8 without Losing Anything](#)

[How to Refresh Windows 8 and Windows 8.1](#)

[How to Create a Refresh Windows Shortcut in Windows 8 and 8.1](#)

[How to Refresh Windows 8 Using a Custom Recovery Image](#)

[How to Refresh or Reset Windows 8 without Installation Disk](#)

[How to Install Windows 8 on VMware Player](#)

[How to Install Windows 8 on VirtualBox](#)

[How to Run the "SFC /SCANNOW" Command at Boot or in Windows 8](#)

[How to Do a System Image Recovery in Windows 8](#)

[How to Use DISM to Fix Component Store Corruption in Windows 8 and Windows Server 2012](#)

Can't boot into Windows V/7/8.1? - Repair Your MBR / Boot Sector / BCD File with These Commands

Go to the Advanced options and choose the Command Prompt

Enter the following commands:

bootrec /fixmbr

bootrec /fixboot

bootrec /scanos

bootrec /rebuildbcd

Still can't boot into Windows:

Enter the "bcdedit" command. A list of items will appear under Windows Boot Manager and under Windows Boot Loader. Look for the following items:

Under Windows Boot Manager, the Device item should be set to unknown

Under Windows Boot Loader, the Device and os device items should be set to unknown.

Run the following three commands to correct the settings:

bcdedit /set {default} device partition=c:

bcdedit /set {default} osdevice partition=c:

bcdedit /set {bootmgr} device partition=c:

Windows 8 fails to boot; Automatic Repair, Refresh, Reset PC also fails

If your Windows 8 fails to boot, it will launch Automatic Repair, in order to attempt to repair Windows. In the event that **Automatic Repair Also Fails**, you will want to use the Refresh your PC or Reset your PC option. To do so, you will select Advanced options > Troubleshoot > Reset or Refresh.

- 1> Under Advanced options > Command Prompt.
- 2> Use the CD command and change the directory to `\Windows\System32\config` folder as follows:
Type `cd %windir%\system32\config` and hit Enter.
- 3> Now you should rename the System and Software registry hives to **System.001** and **Software.001**.
To do so type the following command one after the other and hit Enter:
ren system system.001
ren software software.001
- 4> Finally type Exit to close the Command Prompt
Reboot the PC back to the Automatic Repair screen.
- 5> Select > Advanced options > Troubleshoot > "Reset your PC" or "Reset your PC", as you wish.
- 6> Now just following the directions to [Refresh Your PC](#) as usual.

How To Backup and Restore BCD Store in Windows

BCD (Bootable Configuration Store) Store contains very important information to properly boot up your Windows system. When it's missing or becoming corrupted, or miss configured, your Windows System won't be able to start.

- 1> To make a backup copy of your BCD store, open Command Prompt as Administrator and run the following command: **bcdedit /export filepath\filename**
- 2> To Restore it run the following command: **bcdedit /import filepath\filename**

How to rebuild the BCD store

What if when things really went wrong, such as message like **BOOTMGR is Missing**, that prevents you from booting into any of boot system you have on your computer? When this happens, here is what you can do:

1. Find a Windows 7 or 8 installation media, either DVD or USB, and boot from it.

2. Go to **Repair your computer**, when prompted.

3> If it's a Windows 8 installation media, you will need to go through **Troubleshoot** → **Advanced**

Option → **Command Prompt** to open the Command Prompt window, and run the command

Bootrec

The command **bootrec** has four options to restore your BCD store:

- /FixMbr – writes the master boot record of the system partition using the master boot record
- /FixBoot – write a new boot sector onto the system partition
- /ScanOS – scan all disks for installations compatible with Windows
- /RebuildBcd – scan all disks for installations compatible with Windows and all the users to choose which to add and which to ignore.

The option **/rebuildbcd** is probably the best one you can try to get your BCD store back.