Workbook

Computing Workshop
(CT – 172)

Name

Roll No

Batch

Discipline

Semester\Terms

Department of Computer Science & Information Technology
NED University of Engineering & Technology

Workbook

Computing Workshop
(CT – 172)

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LAB MANUAL

Course Title
"Computing Lab"

Course Code
"CT-172"

Index

Lab-1 (Part-1)
CT-161-Computing Lab

What is BIOS ?

Every computer with a motherboard includes a special chip referred to as the BIOS or **ROM BIOS (*Read Only Memory Basic Input/Output System)***. The BIOS includes instructions on how to load basic computer hardware. The BIOS also includes a test referred to as a POST (*Power On Self Test)* which will ensure that the computer meets requirements to boot up properly. If the computer does not pass the POST, you will receive a combination of beeps indicating what is malfunctioning within the computer.

In most PCs, the BIOS has 4 main functions:

POST - Test computer hardware, ensuring hardware is properly functioning before starting process of loading Operating System.

Bootstrap Loader - Process of locating the operating system. If capable Operating system located, BIOS will pass the control to it.

BIOS - Software / Drivers which interfaces between the operating system and your hardware. When running DOS or Windows you are using complete BIOS support.

BIOS / CMOS Setup - Configuration program which allows you to configure hardware settings including system settings such as computer passwords, time, and date.

CMOS
Also known as a **RTC/NVRAM** or **CMOS RAM**, **CMOS** is short for **Complementary Metal-Oxide Semiconductor**. CMOS is an on-board semiconductor chip powered by a CMOS battery inside computers that stores information such as the system time and system settings for your computer.

What is POST ?
The computer **POST (*Power On Self Test)*** tests the computer, insuring that it meets the necessary system requirements before booting up. If the computer fails the POST, the computer then returns a beep code indicating what is causing the computer not to pass the POST. Generally, if the computer POSTs properly, you will receive a single beep (*with some computer BIOS manufacturers it may beep twice*).

THE POST TEST
Each time the computer boots up the computer must past the POST. Below is the common procedure of the POST:

1. The first step of POST is the testing of the Power Supply to ensure that it is turned on and that it releases its reset signal.
2. CPU must exit the reset status mode and thereafter be able to execute instructions.
3. BIOS must be readable.
4. BIOS checksum must be valid, meaning that it must be readable.

5. CMOS be accessible for reading.
6. CMOS checksum must be valid, meaning that it must be readable.
7. CPU must be able to read all forms of memory such as the memory controller, memory bus, and memory module.
8. The first 64KB of memory must be operational and have the capability to be read and written to and from, and capable of containing the POST code.
9. I/O bus / controller must be accessible.
10. I/O bus must be able to write / read from the video subsystem and be able to read all video RAM..

If the computer does not pass any of the above tests, your computer will receive an irregular POST. An irregular POST is a beep code which is different from the standard, which can be either no beeps at all or a combination of different beeps indicating what is causing the computer not to past the PO ST.

Some of the following are the well-known manufacturer of BIOS.
AMI, DELL, COMPAQ, AWARD, IBM, PHOENIX, GATEWAY,

Lab-1 (Part-2)
CT-161-Computing Lab

Computer CD-ROM drives.

CD-ROM ABCs

A CD-ROM (Compact Disk Read Only Memory) is a drive which reads aluminum-coated round plastic discs, however does not write to the discs. Invented in the United States on 1972, the CD-ROM standard was officially introduced in 1982 when Philips and Sony agreed on the 4.72-inch size format we now use today. Later, as Phillips and Sony continued cooperation in the 1980s, additional specifications were announced concerning the use of CD technology for computer data which evolved into computer CD-ROM drives used today.

CD-ROM DISK SPECIFICATIONS
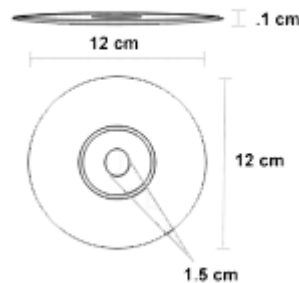
The CD-ROM diskettes are 12 x 12 cm with a width of .1cm, as shown in the above picture. The disc is made of a polycarbonate wafer and is coated with a metallic film, usually an aluminum alloy. This aluminum film is the portion of the disc that the CD-ROM drive reads for information. The aluminum film (strata) is then covered by a plastic polycarbonate coating that protects the underlying data. A label will usually be placed on the top of the disc and data is read from the bottom of the CD.

CD-ROM INTERFACES

SCSI (Small Computer System Interface) - These require a SCSI Host adapter card connected into the system. These cards may be ISA, VLB or even PCI bus cards. It is highly recommended to get a card that matches the CD-ROM drive as some of the earlier drives had proprietary SCSI interfaces. Otherwise, a SCSI-2 card is recommended.

IDE (Integrated Device Electronics) - These CD-ROM drives connect to an IDE port on the motherboard or hard drive interface card. Usually, the IDE controller on the hard drive is set as master and the CD-ROM drive is set to slave. IDE is commonly used for CD-ROMs in standard computers today.

Parallel - Parallel port CD-ROM drives come with special drivers to help communicate through a PC system's parallel port. The transfer rate tends to be slower than other interfacing methods. Biggest advantage is the portability between systems including notebooks.

PCMCIA (PC Card) - Interface now exists for connecting an external CD-ROM drive through the system's PCMCIA port. This is good for portability and provides faster access than the Parallel port

would.

OTHER CD TECHNOLOGIES

CD-R - (*CD Recordable)* Drive which you are able to write to once. Once the drive is written to, it cannot be erased.

CD-RW - (*CD ReWritable*) drive which is a popular alternative to the CD-R drive. CD-RW has the capability of being written to at least one thousand times. The drawback with CD-RW discs is with the lower reflectivity of the disc itself can limit the readability. Many CD-ROM and CD-R drives may have a difficult time reading these disks.

DVD - (*Digital Versatile Disc*) New standard released in 1995 which originally was called Digital Video Disc and later changed to Digital Versatile Disc. DVD offers an initial storage capacity of 4.7GB (of digital information on a single-sided, single-layer disc the same diameter and thickness of a current CD-ROM

CD-ROM TRANSFER RATES

Below is the standard transfer rates and access times of the majority of CD-ROM drives. The below figures are averages you can expect to find on each speed of CD-ROM drive. These averages may be slower or faster than your CD-ROM drive and to where the CD-ROM is accessing the data from the CD-ROM.

DRIVE SPEED	TRANSFER RATE (BPS)	ACCESS TIME (ms)
Single-speed (1x)	153,600	400
Double-speed (2x)	307,200	300
Triple-speed (3x)	460,800	200
Quad-speed (4x)	614,400	150
Six-speed (6x)	921,600	150
Eight-speed (8x)	1,228,800	100
Ten-speed (10x)	1,536,000	100
Twelve-speed (12x)	1,843,200	100
Sixteen-speed (16x)	2,457,600	90
Eighteen-speed (18x)	2,764,800	90
Twenty-four-speed (24x)	3,686,400	90
Thirty-two-speed (32x)	4,915,200	85
One-hundred-speed (100x)	15,360,000	80
CAV drives (12x - 24x)	1,843,200 - 3,686,400	150-90

Some useful definitions:

What is **X** in Computer CD-ROM Drive:

1. In general an x is used to represent any single digit. For example, companies list Microsoft Windows 3.x that indicates Windows 3.1 or Windows 3.11 or Microsoft Windows 9x that means either Windows 95 or Windows 98
2.
   When referring to a computer CD drive, an **X** refers to the transfer speed. For example, the

original 1X CD-ROM had a speed of 153,600 BPS, this means a 24X has a BPS of 3,686,400 or 153,600 x 24. The higher the number the faster data is going to be read from the CD drive.

VCD

Also known as **VideoCD, VCD** is a concept introduced in 1993 by Philips, JVC and Sony that allows for the storage of MPEG-1 video on a CD-ROM. Each VCD is capable of holding up to 74 minutes of video on a 680MB CD.

DVD

Short for either **Digital Versatile Disc** or **Digital Video Disc**, **DVD** or **DVD-ROM** is a type of disc drive that allows for large amounts of data on one disc the size of a standard Compact Disc. DVD drives were first sold in 1997 and today are widely used for storing and viewing movies and other data. To play a DVD on a computer a user must have a DVD drive as well as a DVD player, which is a software program designed to play and control a DVD disc.

SVCD

Short for **Super Video CD, SVCD** is an upgrade to Video CDs (VCDs) that enables higher compression using MPEG-2 which enables for longer videos to be stored on the disc.

Track

1. When referring to an audio CD a track is a section of a CD that contains a single full song. Tracks are used on a CD to help enable a user to easily skip songs or locate a song on a CD.
2. A track is also a data storage ring on a computer floppy diskette or hard disk drive that is capable of containing information. As shown in the below example a track goes all around the platter and is used to help locate and retrieve information from a disk or diskette.
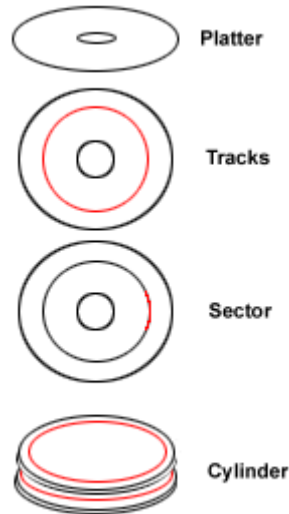
RIP

Short for **ripping**, **rip** is a term used to describe the process of taking data off of a CD or other disc and either store it on the computer and/or put it onto another CD or disc.

CDFS

Short for **CD File System**, **CDFS**, in Linux systems, is a file system that exports all tracks and boot images on a CD as normal files; in Windows, the CDFS is the Windows driver for CD-ROM players. CDFS replaces MSCDEX which was used for MS-DOS and is a 32-bit program that runs in protected mode. In addition, CDFS uses a VCACHE driver to control the CD-ROM disk cache allowing for a smoother play back.

Lab-1 (Part-3)
CT-161-Computing Lab

OPERATING SYSTEM

An Operating System, or OS, is a software program that enables the computer hardware to communicate and operate with the computer software. Without a computer Operating System, a computer would be useless.

OPERATING SYSTEM TYPES

As computers have progressed and developed so have the types of operating systems. Below is a basic list of the different types of operating systems and a few examples of Operating Systems that fall into each of the categories.

GUI - Short for Graphical User Interface, a GUI Operating System contains graphics and icons and is commonly navigated by using a computer mouse. A GUI uses windows, icons, and menus to carry out commands such as opening files, deleting files, moving files, etc. and although many GUI Operating Systems are operated by using a mouse, the keyboard can also be used by using keyboard shortcuts or arrow keys.

Unlike a command line Operating System like UNIX or MS-DOS, GUI Operating Systems are much easier for end-users to learn and use because commands do not need to be known or memorized. Because of their ease of use, GUI Operating Systems have become the dominant Operating System used by end-users today.

A few examples of a GUI Operating Systems:

1. Microsoft Windows 95
2. Microsoft Windows 98
3. Microsoft Windows 98 SE
4. Microsoft Windows NT Workstation
5. Microsoft Windows Server
6. Microsoft Windows ME
7. Microsoft Windows 2000 Professional
8. Microsoft Windows 2000 Server
9. Microsoft Windows 2000 Advanced Server
10. Microsoft Windows 2000 Datacenter Server
11. Microsoft Windows 2003 Server
12. Microsoft Windows 2003 Advanced Server
13. Microsoft Windows 2003 Web Server
14. Microsoft Windows XP Professional
15. Microsoft Windows XP Home
16. Microsoft Windows Vista
17. Sun Solaris
18. Apple Mac OS.
19. Linux

20.Unix

Multi-user - A multi-user Operating System allows for multiple users to use the same computer at the same time and/or different times. Below are some examples of multi-user Operating Systems.

Linux
UNIX
Windows 2000
Windows XP

Multiprocessing - An Operating System capable of supporting and utilizing more than one computer processor. Below are some examples of multiprocessing Operating Systems.

Linux
UNIX
Windows 2000
Windows XP

Multitasking - An Operating system that is capable of allowing multiple software processes to run at the same time. Below are some examples of multitasking Operating Systems.

Linux
UNIX
Windows 2000
Windows XP

Multithreading - Operating systems that allow different parts of a software program to run concurrently. Operating systems that would fall into this category are:

Linux
UNIX
Windows 2000
Windows XP

OPERATING SYSTEM LISTINGS

OPERATING SYSTEM	PLATFORM	DEVELOPER
AIX / AIXL	Various	IBM
AmigaOS	Amiga	Commodore
BSD	Various	BSD
Caldera Linux	Various	SCO
Corel Linux	Various	Corel
Debian Linux	Various	GNU
DUNIX	Various	Digital
DYNIX/ptx	Various	IBM

HP-UNIX	Various	Hewlett Packard
IRIX	Various	SGI
Kondara Linux	Various	Kondara
Linux	Various	Linus Torvald
MAC OS	Apple Macintosh	Apple
Mandrake Linux	Various	Mandrake
MINIX	Various	MINIX
MS-DOS 6.x	IBM / PC	Microsoft
NEXTSTEP	Various	Apple
OSF/1	Various	OSF
QNX	Various	QNX
Red Hat Linux	Various	Red Hat
SCO UNIX	Various	SCO
Slackware Linux	Various	Slackware
Sun Solaris	Various	Sun
SuSE Linux	Various	SuSE
System 1	Apple Macintosh	Apple
System V	Various	System V
Tru64 UNIX	Various	Digital
Turbolinux	Various	Turbolinux
Ultrix	Various	Ultrix
Unisys	Various	Unisys
UNIX	Various	Bell labs
UnixWare	Various	UnixWare
VectorLinux	Various	VectorLinux
Windows 2000	IBM / PC	Microsoft
Windows 2003	IBM / PC	Microsoft
Windows 3.X	IBM / PC	Microsoft
Windows 95	IBM / PC	Microsoft
Windows 98	IBM / PC	Microsoft
Windows CE	PDA	Microsoft
Windows ME	IBM / PC	Microsoft
Windows NT	IBM / PC	Microsoft
Windows Vista	IBM / PC	Microsoft
Windows XP	IBM / PC	Microsoft
Xenix	Various	Microsoft

MS-DOS Operating System

Microsoft DOS (Disk Operating System) is a command line user interface. MS-DOS 1.0 was released in 1981 for IBM computers and the latest version of MS-DOS is MS-DOS 6.22, which was released in 1994. While MS-DOS is not commonly used by itself today, it still can be accessed from every version of Microsoft Windows by clicking Start / Run and typing "**command**" or by typing "**CMD**" in Windows NT, Windows 2000 or Windows XP.

UNIX Operating System

Unix, which is not an acronym, was developed by some of the members of the Multics team at the bell labs starting in the late 1960's by many of the same people who helped create the C programming language. The UNIX today, however, is the not just the work of a couple of programmers. Many other organizations, institutes and various other individuals contributed significant additions to the system we now know today.

Linux Operating System

Developed by Linus Torvalds and further elaborated by a number of developers throughout the world, Linux is a freely available multitasking and multi-user operating system. From the outset, Linux was placed under General Public License (GPL). The system can be distributed, used and expanded free of charge. In this way, developers have access to all the source codes, thus being able to integrate new functions easily or to find and eliminate programming bugs quickly.
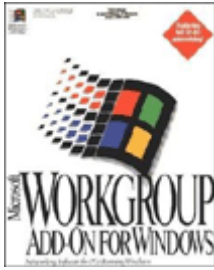
WINDOWS CE

Microsoft Windows CE 1.0 was originally released in 1996 to compete in the Palm Device Assistant Category. Windows CE, as shown below, has many of the same features as Windows 95.

In addition to the look of Windows 95, Windows CE also includes similar applications such as Pocket Excel, Pocket Word, and Pocket Power.

WINDOWS 3.x

Released in 1990, Microsoft Windows 3.0 was a revolutionary operating system for the PC as one of the most used GUI operating systems.

Later Windows 3.1 was released in 1992 by Microsoft and was one of the first major PC GUI operating systems widely used. Windows 3.1 allowed users to utilize several features previously not available in MS-DOS. Some of these new features were the use of a mouse which allowed the user to navigate and manipulate data on the computer with one hand simply and easily and now did not have to memorize MS-DOS commands. In addition to the mouse, Windows now allowed the user to multitask, meaning the user could now run multiple applications at once without having to close out of each program before running another. Windows along with other GUI operating systems are one of the many reasons computers have become easier and more widely used.

MICROSOFT WINDOWS 95

The next installment of Windows from Windows 3.11. Windows 95 added major enhancements when compared to Windows 3.11.

Below are some of the new features that Windows 95 has that Windows 3.x does not.

Plug and Play Allows hardware devices to be automatically installed into the computer with the proper software.
32 Bit 32-Bit operating system allowing the computer to run faster and more efficiently.
Registry Combines the power of multiple configuration files into two files, allowing the system configurations to be located easier.
Memory Windows 95 has an improved memory handling processes compared to Windows 3.11.
Right mouse click Allows you new access and text manipulation by utilizing both buttons instead of one.
CD-Player Enhanced CD-Player with improved usability and AutoPlay feature.

MICROSOFT WINDOWS 98

Microsoft Windows 98 is the upgrade to Microsoft <u>Windows 95</u>. While this was not as big as release as Windows 95, Windows 98 has significant updates, fixes and support for new peripherals. Below is a list of some of its new features.

- **Protection** - Windows 98 includes additional protection for important files on your computer such as backing up your registry automatically.
- **Improved support -** Improved support for new devices such as AGP, DirectX, DVD, USB, MMX
- **FAT32** - Windows 98 has the capability of converting your drive to FAT32 without losing any information.
- **Interface** - Users of Windows 95 and NT will enjoy the same easy interface.
- **PnP** - Improved PnP support, to detect devices even better than Windows 95.
- **Internet Explorer 4.0 -** Included Internet Explorer 4.0
- **Customizable Taskbar** - Windows adds many nice new features to the taskbar which 95 and NT do not have.
- **Includes Plus! -** Includes features only found in Microsoft Plus! free.
- **Active Desktop** - Includes Active Desktop which allows for users to customize their desktop with the look of the Internet.

WINDOWS 98 SE

Includes the same additional features as Windows 98; however, includes additional fixes and all of Year 2000 patches have been included in Windows 98 Second Edition. Below is a listing of the various new features Windows 98 SE includes.

Updates - Includes all the latest updates such as the Year 2000 updates, USB support, and more.
Software - Updated versions of Internet Explorer, Outlook Express, Windows Media Player, DirectX, NetMeeting and more.
Drivers / Support - Additional support for latest technology such as MMX, USB, Intel Pentium III and more.

WINDOWS ME

Windows Millennium, also known as **Windows ME**, was introduced September 14, <u>2000</u> to the general public as the upgrade for Windows 95 and Windows 98 users and is designed for end-users. Overall, Windows ME has the look and feel of Windows 98 with some additional fixes and features not available in previous operating systems.

While Windows ME includes some of the latest fixes and updates and some enticing new features, we recommend this update only for users that may find or want some of the new features listed below or for users who are purchasing a new computer with this operating system included.

NEW FEATURES

Some of the most noticeable new features include:

Revert back to backup of computer - Windows Me allows the user to automatically restore an old backup in case files are corrupted or deleted.

Protect important system files - Windows Me allows the user to protect important system files and will not allow these files to be modified by any type of other software.

Movie editor - Allows users to edit and or combine Microsoft movie files. Importing movies requires additional hardware.

Windows Media Player - Includes Media Player 7, which enables users a more advanced way of listening and organizing their media files.

MICROSOFT WINDOWS NT

Windows NT 4.0 has the look and feel of <u>Windows 95</u>; however, it is a completely different Operating System. Windows NT contains advanced security features, advanced network

support, full 32-bit operating system, advanced multitasking, user administration and much more. While NT is a very advanced operating system, it does lack the support of drivers, features, and gaming support when compared to Windows 95 / Windows 98 and is why, even today, Windows NT is still used primarily by businesses and technical users.

MICROSOFT WINDOWS 2000

Windows 2000 is based of the Windows NT Kernel and is sometimes referred to as Windows NT 5.0. Windows 2000 contains over 29 Million lines of code, mainly written in C++. 8 Million of those lines alone are written for drivers. Currently, Windows 2000 is by far one of the largest commercial projects ever built.

Some of the significant features of Windows 2000 Professional are:

- Support for FAT16, FAT32 and NTFS.
- Increased uptime of the system and significantly fewer OS reboot scenarios.
- Windows Installer tracks applications and recognizes and replaces missing components.
- Protects memory of individual apps and processes to avoid a single app bringing the system down.
- Encrypted File Systems protects sensitive data.
- Secure Virtual Private Networking (VPN) supports tunneling in to private LAN over public Internet.
- Personalized menus adapt to the way you work.
- Multilingual version allows for User Interface and help to switch, based on logon. Includes broader support for high-speed networking devices, including Native ATM and cable modems.
- Supports Universal Serial Bus (USB) and IEEE 1394 for greater bandwidth devices.

MICROSOFT WINDOWS XP

Codenamed Whistler, Microsoft Windows XP is short for Windows Experienced and is the convergence of the two major Microsoft operating systems into one.

Windows XP is available in the below versions:

Windows XP Home Edition
Professional XP Professional

Windows XP is designed more for users who may not be familiar with all of Windows features and has several new abilities to make the Windows experience more easy for those users.

Windows XP includes various new features not found in previous versions of Microsoft Windows. Below is a listing of some of these new features.

- New interface - a completely new look and ability to change the look.
- Updates - new feature that automatically obtains updates from the Internet.
- Internet Explorer 6 - Includes internet explorer 6 and new IM.
- Multilingual support - added support for different languages.

WINDOWS VISTA

Windows Vista is the next version of Microsoft Windows operating system, superseding Windows XP. It was previously known by its codename **Longhorn.**

Windows Vista has many new features such as an updated graphical user interface called Aero, improved searching technology, a number of new security features, and completely new networking, audio, print, and display engines. Vista also aims to increase the level of communication between machines on a home network, making it easy to share files, password settings, and digital media between computers and devices.

Lab-2
CT-161(Computing Lab)

Hard Drive/Storage Device

Storage devices on your computer are responsible for storing data, such as the operating system, applications, and actual output of applications or user data. Depending on the amount and type of data, there are three basic types of devices to work with:
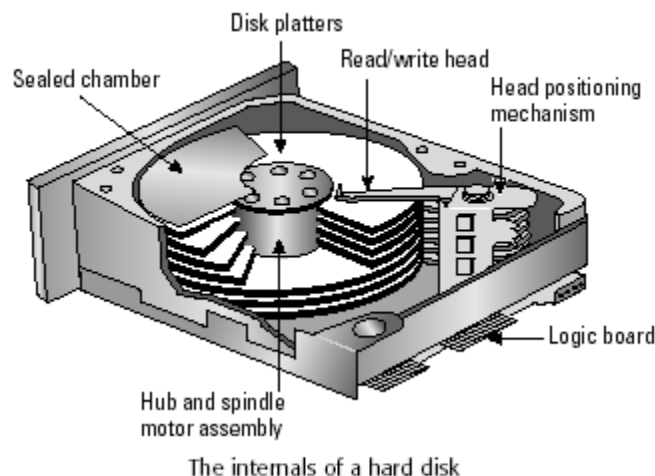
- Floppy drives, including some of the high-capacity formats such as 120MB Superdisks
- Hard drives, including some of the removable cartridge drives such as SyQuest drives
- Optical drives, including CD-ROM and DVD drives

When dealing with hard drives, there are two major attachment interfaces: IDE (Integrated Device Electronics) or ATA (AT Attachment), and SCSI (Small Computer System Interface). ATA opens up the IDE interface to accept a wider variety of devices. The type of drives that you will be attaching to your computer will depend on the types that are supported by your motherboard or I/O cards.

Hard Drive Geometry

Platters
A *platter* is a physical object (actually, a plate) that resides inside the hard disk and is responsible for storing the data. A platter is similar to a record on an old record player—the main difference being that a hard disk has many platters, while a record player only holds one record at a time. Figure -1 shows the platters inside a hard disk.

Disk platters
Read/write head
Sealed chamber
Head positioning mechanism
Logic board
Hub and spindle motor assembly
The internals of a hard disk

The platters are very much like records on a record player in the sense that they spin around in a circle on a spindle that runs through the center of all the platters. Each platter has two sides for storing information, and each side of the platter has a unique ID. The ID for the first side of the first platter is 0, and each side increases by 1. For example, if there were two platters in the disk, the first platter would have Side 0 and Side 1, while the second platter would have Side 2 and Side 3. Figure -2 illustrates this concept.

Sides of platters
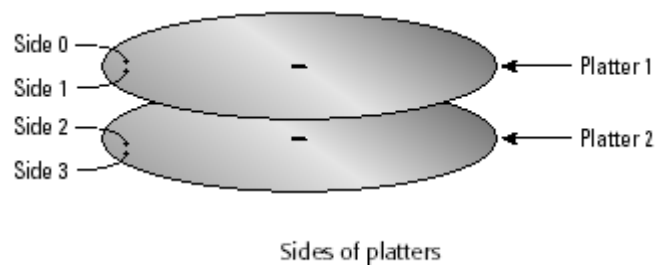
Since there will be a writing mechanism—a head—for each side of the platter, many people use the terms "head" and "side" interchangeably. The head is more accurately called the *read/write head*, because it will move over the disk surface and read or write to the disk. Like a needle on a record player, the read/write head moves over the surface of the disk with the help of an arm, called the *actuator arm* (also known as the *head positioning mechanism*). Looking back at Figure -1, the figure shows the read/write head on an actuator arm (head positioning mechanism).

There is a read/write head for each platter surface on the disk. When information is written to the disk, the read/write head will move to the same track on all platters in a single movement and then write to the same track on all platters. The actuator arm has multiple read/write heads on it.

Tracks

Just as there are tracks, on a record or music CD, there are also *tracks* on each platter. These tracks are evenly spaced across the platter's surface.

Sectors

The platter is divided into pie slices, thus dividing the tracks into 512-byte sectors. Sectors are the actual storage areas for data, and each has an address that is made up of the platter side number, the track number, and the sector number on that track. Figure 3 illustrates the tracks and sectors on a disk platter.

Tracks and sectors on a disk platter
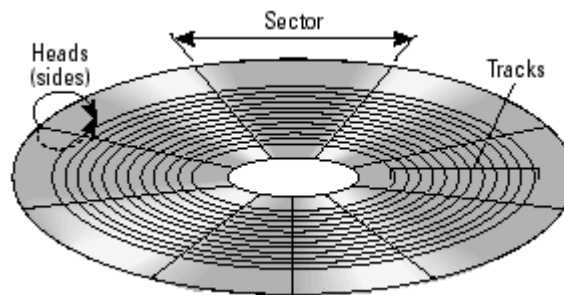
Clusters

A group of any number of sectors can make up a *cluster*. When a partition is formatted, the file system will determine the cluster size based off the partition size. For example, a partition that is 2GB in size formatted as FAT will use a 32K-cluster size. That same 2GB partition formatted as FAT32 will use only a 4K-cluster size.

Having a partition use a 4K-cluster size means there will be 8 sectors that make up a cluster. Keep in mind that once a file has been saved to the cluster, no other file can occupy that cluster. For example, if you had a 32K-cluster size and you saved a 3K file to the hard disk, the file would be saved to an empty cluster—but only 3K of it would be used, and the remaining 29K would be left

unused. The remaining 29K is now considered unusable space; no other file can be saved to that unused 29 K.

Cylinders

Each platter in the disk contains the same number of tracks; these tracks are numbered from the outside in, starting with zero. For example, if there were ten tracks on a platter, the track closest to the edge of the platter would be Track 0, while the track closest to the center would be Track 9.

A cylinder consists of the same track on both sides of all the platters. In other words, when you reference Track 0, you reference a particular track on a particular platter, but when you reference Cylinder 0, you reference Track 0 on all platters. If you know the number of cylinders, heads, and sectors per track, you can calculate the size of a disk. For example, if you have a drive that has 4,092 cylinders, 16 heads, and 63 sectors per track, the size of the disk would be 2,111,864,832 bytes (2.1GB).

Read/Write Process

Platters are divided into 512 byte sectors. These sectors are the area on the platter that data is written to. The platters have a magnetic coating applied to them that is extremely sensitive to magnetism. While the platters are rotating in a circle, the read/write heads are moved over the disk surface to the location where they need to write (or save) information. The read/write heads do not actually touch the surface of the disk platters; instead, they "hover" about ten micro-inches (or millionths of an inch) above—that's not even enough space to place a hair between the read/write head and the platter's surface. This design helps improve disk performance, because a read/write head that made contact with the platter would cause friction, slowing down the rotation speed of the disk.

While the platters spin around in circles, the read/write head moves from track to track until it reaches the desired one. Then it waits for the appropriate sector to move underneath it, at which time the read/write head is energized to apply a magnetic charge to the particles in the disk coating. This changes the particle binary state from zero to one, thus creating data.

Performance

Disk performance can be measured in terms of several important characteristics: seek time, latency, access time, and the spin speed of the disk. Table below describes these characteristics.

Measuring Hard Disk Performance	
Characteristic	**Description**
Seek time	*Seek time* is the time it takes to move the read/write heads to the desired track. Seek time is a calculated average, since the time it takes to move to the desired track will differ from one instance to another. For example, if the read/write heads are on Track 1, they will take a longer amount of time moving to Track 12 than to Track 3 (because the distance is greater between Track 1 and Track 12). Seek time is measured in milliseconds, or millionths of a second.
Latency	*Latency* is the time it takes for the appropriate sector to move under the read/write head. Latency is measured in milliseconds.
Access time	*Access time* is a term used to describe the overall speed of the disk. It is a combination of seek time and latency. The lower the access time, the better.
Spin speed	*Spin speed* is the speed at which the platters spin in a circle, measured in revolutions (rotations) per minute, or rpm. The larger the rpm value the faster the disk, which means less latency.

shows how seek time is measured.
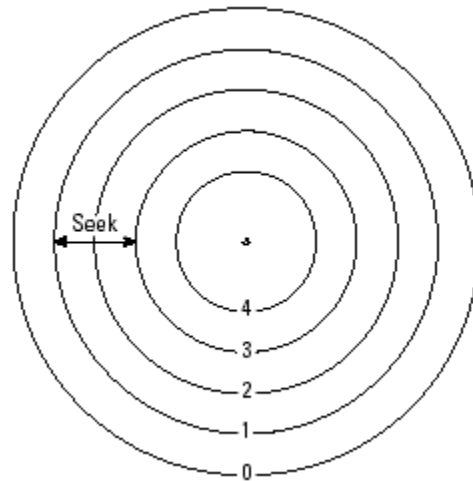
Measuring seek time

Master boot record

While I'm discussing disk geometry, I should make a brief comment about the Master Boot Record. The *Master Boot Record (MBR)* is the first sector on the first track of the first side of the first platter; it holds the operating system boot code that controls the loading of the operating system. The MBR also holds drive characteristics—such as the partition table. During the boot process the system has to find a primary partition that is active and it will do this by looking in the boot record.

In general, if anything goes wrong with the MBR, you will be unable to boot the system. Since this boot record is always found in the same location on every disk, it becomes very easy for developers to write viruses that will modify or corrupt it. This is one reason you should always run virus detection software.

IDE overview

The *hard drive controller* is responsible for converting signals made by the system CPU to signals that the hard disk can understand. These signals include instructions on where to find data and how to get there. The hard disk would perform its task and any data that needed to be returned

would be sent to the controller from the hard disk. The controller would then convert the signals from the hard disk to signals that the system could understand.

Integrated Drive Electronics (IDE).

Today, controllers are integrated into the drive itself, meaning the drive is its own boss. There are also controllers on the motherboard (the primary IDE controller and the secondary controller). An important limitation with IDE is that there could only be two devices in a chain. SCSI is stronger in that respect: it supports at least eight devices in a chain. IDE devices have a transfer rate of about 10Mbps and may have cache on the drive
itself. The cache memory is a small amount of memory for storing data that is used frequently to increase drive performance.

IDE Versus EIDE		
Characteristic	*IDE*	*EIDE*
Size	528MB	40GB and higher
Devices in Chain	2	4
Transfer Rate	10Mbps	16Mbps
Types of Devices	Hard drives	Hard drives, CD-ROMs

SCSI (Small Computer System Interface)

SCSI is an acronym for *Small Computer System Interface*. The important part of this term is "small computer." SCSI environments use a SCSI controller that is responsible for managing all SCSI devices and controlling the conversation on the SCSI chain.
SCSI technology has many advantages over IDE technology, such as:
- Types of devices supported
- Number of devices supported in a single SCSI chain
- Performance of SCSI over IDE devices

SCSI supports a multitude of devices, including hard drives and CD-ROMs.
Remember that IDE devices typically only support hard drives and CD-ROMs. SCSI devices come in the following flavors:

- Hard drives
- CD-ROMs
- Scanners
- Printers
- Tape drives

The other major benefit of SCSI is the number of devices that are supported in the SCSI chain, or what is known as the *SCSI bus*. Original SCSI supports up to eight devices in the chain, but one of those devices is the SCSI card that's added to the computer to give you the capability to use SCSI. Remember that IDE only allowed two devices in the chain, and EIDE supports four devices, so with SCSI you are not only allowed to have more types of devices, but you are also allowed to have more of those devices!

Host adapter
When you install SCSI devices, you first need to install the SCSI host adapter. The SCSI host adapter is an expansion card that you add to the computer so you can chain SCSI devices off the adapter. In essence, the SCSI host adapter is the brains of the SCSI bus; it acts as the controller for the SCSI bus. Figure -5 shows the SCSI adapter being inserted into an expansion slot in the system.

SCSI host adapter card

PCI slot
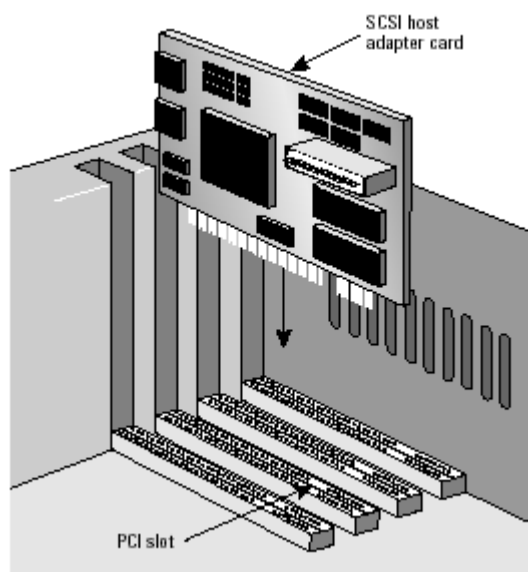
Lab-2 (Part-2)
CT-161-Computing Lab
Hard Drive Formatting

This is a general guide / overview on the procedure to format your hard drive.

Now to begin, you will need a MS Dos6.xx or Windows95/98 boot disk or bootable CD-ROM.

STEP ONE
You first need to decide what operating system you intend to load after formatting the hard drive. It is best and easiest to use a boot disk for that Operating System, such as MS Dos6.2 or Windows95 or Windows98SE.   You will need the proper Windows95/98 boot disk in order to load the these operating systems on the computer, else it will reject loading due to the wrong Operating System on the computer.

STEP TWO

Insert your boot disk in the floppy drive or bootable CD-ROM and start the computer. Once the system has completed booting and an A: prompt appears we are ready to start.

Type: format C: /s   [press Enter]

This statement tells the system to format your "C" drive and when it is finished to copy the system files to the drive, (the /s switch for 'System').   You can format a different drive this way by using a different drive letter.

**Format should display: WARNING, ALL DATA ON
NON-REMOVABLE DISK DRIVE C: WILL BE LOST!
Proceed with Format (Y/N)? Type** [Y] [Press ENTER]

Your screen should display the size of your drive and a countdown in percentage of formatting completed. Depending on your computer's speed and the size of the drive it can take from a few minutes to over 15minutes.

STEP THREE

When it reaches 100% complete, you will see a new message:
FORMAT COMPLETE. SYSTEM TRANSFERRED.

This indicates that the files required to boot your computer from the hard drive have been copied from the floppy to the hard drive. The computer can now boot from the hard drive without a boot disk in the floppy drive.

You will see one last message:
Volume label (11 characters, ENTER for none)?
Type anything you like or leave it blank - [Press ENTER]

You can now begin to load your Operating System.

Lab-3 (Part-2)
CT-161-Computing Lab

Windows 98 quick installation method.

How to install <u>Windows 98</u> First or Second Edition on a <u>computer</u> with a formatted or even unformatted hard drive!

What you will need:

1. Windows 98 CD
2. Computer with CD-ROM Access

Configuring your BIOS for the Install:

To find out how to access the <u>BIOS</u> please refer to your motherboard manual or the manufacturer of your computer. (The system BIOS can usually be entered on boot, usually by pressing the F1, F2, F8, F10 or DEL key. Make sure you save the settings before exiting. If you are unsure or don't want to enter the BIOS then just test the computer by putting the <u>CD-ROM</u> in the drive and rebooting the computer. This is the recommended way to install <u>Windows 98</u>.

Starting the Setup:

1. Insert the Windows CD and restart your PC.
2. Once the Windows 98 Setup Menu comes up choose option #2 (Boot from CD-ROM)
3. Then the Windows 98 Startup Menu will come up. Select Option #1. (Start Windows 98 Setup from CD-ROM)
4. Now your computer will install some drivers so please wait for a few moments.
5. Now a blue setup screen will come up. Press Enter.
6. Setup then wants to do some system tests. Just press Enter.
7. Scandisk will now run, please wait.
8. After ScanDisk completes, Windows will copy a few important files for setup.
9. Now the graphical Windows 98 Setup Screen will come up.
10. Click Continue and wait for the setup wizard to complete.
11. Now it will ask you in which directory to install Windows too. The default directory is just fine so click Next.
12. Setup will now prepare the directory, please wait.
13. Setup will now check for installed components and <u>disk space</u>, please wait.
14. Setup will now prompt you to choose the type of installation. Choose Typical if you have a desktop computer or Portable if it is a laptop.
15. Windows will prompt you to install components, just choose Continue.
16. If a network card is detected a network information screen will appear. Type in the required information and click Next
17. Select your country settings, United States should be chosen by default.
18. Now finally the main part of Setup is here. Setup will start copying files. This could take some time, please be patient.
19. Once setup is done copying files, Windows will restart automatically.
20. The Windows 98 Startup Menu will now appear. Select option #1 (Boot from Hard Disk)
21. The Windows 98 booting screen will appear!
22. Now Windows will prompt you for user information, enter it and click Continue.
23. Now the License Agreement. Read it and if you agree click on "I accept the Agreement" and click Next. If you select "I don't accept the Agreement" then setup will end.

24. Now input your product key or certificate authenticity code. This is 16 digits and is located on the back of your CD case or on the Windows 98 Book. If you have an OEM computer then it could be on the side or back of your computer. Click Next to continue.
25. Click Finish.
26. Setup will now finalize the hardware and install settings.
27. Setup will now install plug and play devices.
28. Your computer will restart automatically.
29. The Windows 98 Startup Menu will appear. Select option #1 (Boot from Hard Disk)
30. Windows will start booting for the second time.
31. Setup will continue installing hardware.
32. Now setup will prompt you to enter in your time, date, and time zone. Once selected click on Apply and then OK.
33. Windows will continue to setup Windows items.
34. The computer will restart automatically once again.
35. The Windows 98 Startup Menu will appear. Select option #1 (Boot from Hard Disk)
36. Windows will boot for the third time.
37. Windows will update system settings.
38. Now finally you have reached the Windows Desktop!
39. You also may need to install your hardware drivers. If everything is working properly then you shouldn't worry about them.

Enjoy your new freshly installed Windows 98 computer!

Prepared by: Dr. Shaikh Wahabuddin Usmani

Department of Computer Science & Information Technology
NED University of Engineering & Technology, Karachi

INTRODUCTION

Welcome to Windows 2000 Professional install in a new hard drive (HDD). This guide is step by step and fully graphical.

What you will require to do this walkthrough is:

1. **A Windows 2000 Professional CD**
2. **A Computer with CD-ROM access**

To start the install, first check that the first boot device in your system BIOS is set to the CD-ROM Drive.

(To find out how to access the BIOS please refer to your motherboard manual or the manufacturer of your Laptop. (The system bios can usually be entered on boot, usually by pressing the F1, F2, F8, F10 or DEL key. Make sure you save the settings before exiting))

If you are unsure or don't want to enter the BIOS then just test the computer by putting the CD-ROM in the drive and reboot your computer. This is the recommended way to install windows.

PART 1

Now insert the Windows 2000 Professional CD and reboot your computer. As the Hard Drive is blank Windows will automatically start to install. This may take some time as Windows copies file in preparation to install.

```
Press any key to boot from CD.
```

Now press "ENTER" to start the Install.


```
Windows 2000 Professional Setup

    Welcome to Setup.

    This portion of the Setup program prepares Microsoft(R)
    Windows 2000(TM) to run on your computer.

        • To set up Windows 2000 now, press ENTER.

        • To repair a Windows 2000 installation, press R.

        • To quit Setup without installing Windows 2000, press F3.




    ENTER=Continue   R=Repair   F3=Quit
```
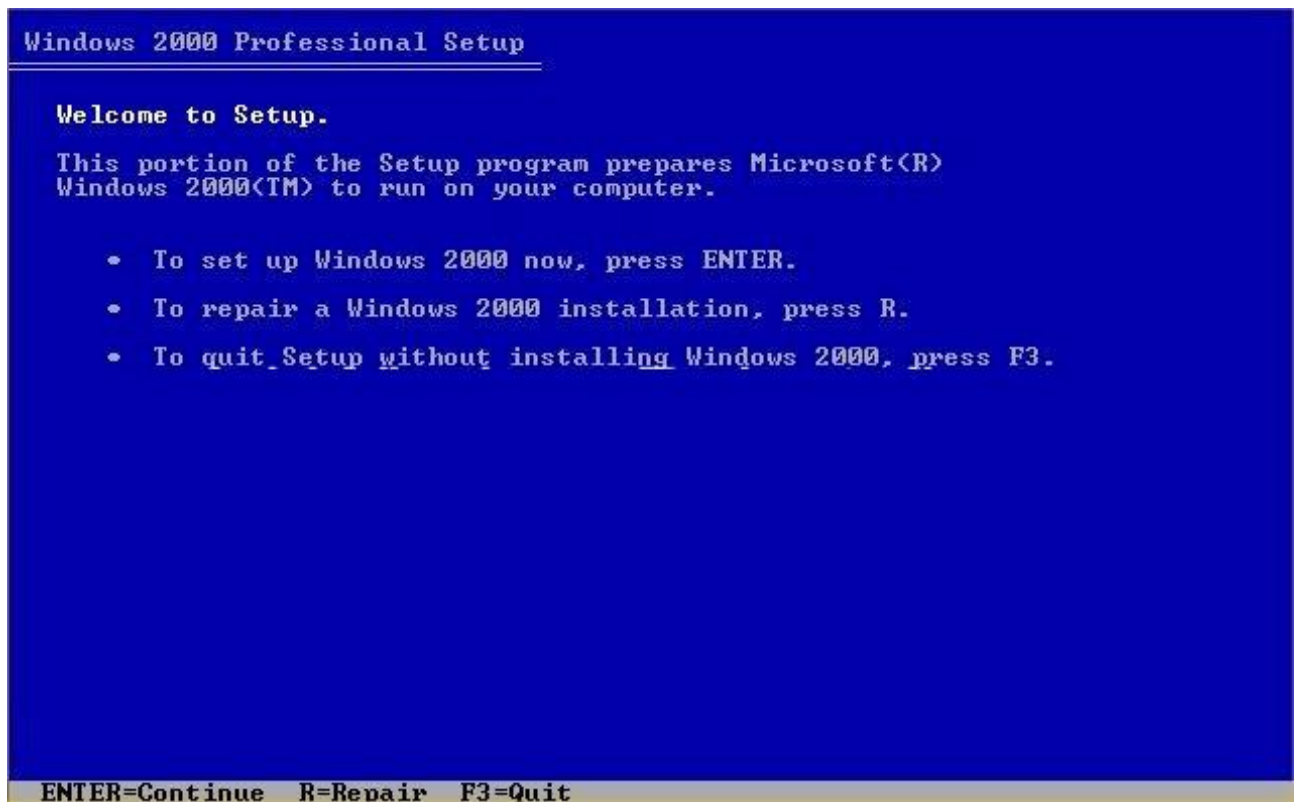
Now the user Agreement, read and Press "F8" to continue, if you disagree press "ESC", setup will then exit.

Windows 2000 Licensing Agreement

Microsoft Windows 2000 Professional VERSION

END-USER LICENSE AGREEMENT FOR MICROSOFT
DESKTOP OPERATING SYSTEMS

IMPORTANT-PLEASE READ THIS END-USER LICENSE
AGREEMENT ("EULA") CAREFULLY. THIS EULA IS
A LEGAL AGREEMENT BETWEEN YOU (EITHER AN
INDIVIDUAL OR A SINGLE LEGAL ENTITY) AND THE
IMPORTANT-PLEASE READ THIS END-USER LICENSE
AGREEMENT ("EULA") CAREFULLY. THIS EULA IS
A LEGAL AGREEMENT BETWEEN YOU (EITHER AN
INDIVIDUAL OR A SINGLE LEGAL ENTITY) AND THE

The SOFTWARE includes Microsoft computer software, and may
include associated media, printed materials, "online" or
electronic documentation and Internet based services. Note,
however, that any software, documentation, or web services that
are included in the SOFTWARE, or accessible via the SOFTWARE,
and are accompanied by their own license agreements or terms of
use are governed by such agreements rather than this EULA. The
terms of a printed, paper EULA, which may accompany the SOFTWARE,
supersede the terms of any on-screen EULA.

This EULA is valid and grants the end-user rights ONLY if the

F8=I agree   ESC=I do not agree   PAGE DOWN=Next Page

Now you will be given the option to setup the hard drive, if you wish to use maximum space then just press "ENTER" to continue, otherwise use "C" to setup smaller partitions.

Windows 2000 Professional Setup

The following list shows the existing partitions and
unpartitioned space on this computer.

Use the UP and DOWN ARROW keys to select an item in the list.

 • To set up Windows 2000 on the selected item, press ENTER.

 • To create a partition in the unpartitioned space, press C.

 • To delete the selected partition, press D.

16379 MB Disk 0 at Id 0 on bus 0 on atapi
      Unpartitioned space   16379 MB

ENTER=Install   C=Create Partition   F3=Quit

Now select how you wish to have the hard drive formatted. Use the following as a guide for duel

booting.

NTFS for Windows 2000 or XP

FAT for Windows ME and 98

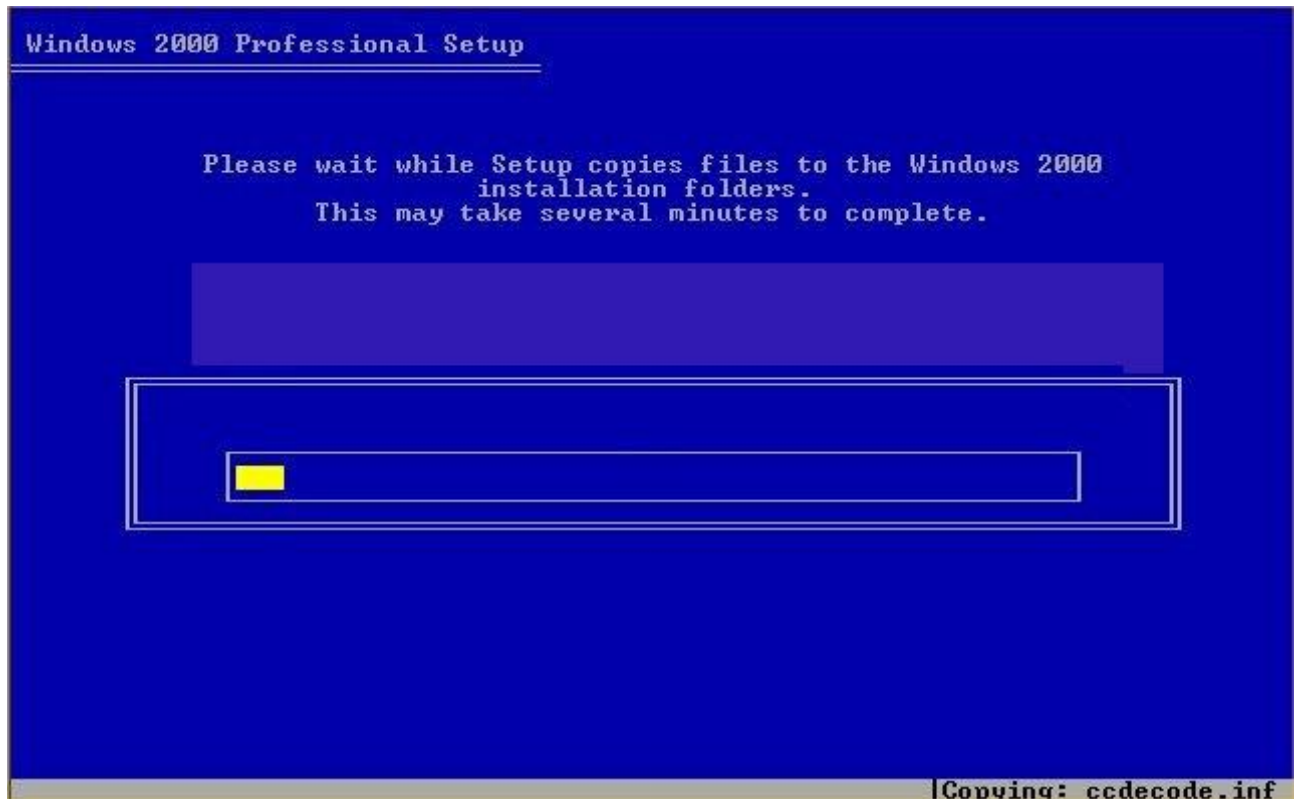Press "ENTER" once choice is made to start format.

Drive will now format, this can take some time depending on hard drive size.

```
Windows 2000 Professional Setup

            Please wait while Setup formats the partition
          C:  New (Unformatted)                   16371 MB
          on 16379 MB Disk 0 at Id 0 on bus 0 on atapi.




          Setup is formatting...
                                    21%

          [                                              ]
```

Setup will now examine the Drives….

and then copy files to the installation folder.

```
Windows 2000 Professional Setup
_____


          Please wait while Setup copies files to the Windows 2000
                         installation folders.
                This may take several minutes to complete.






         ┌──────────────────────────────────────────────────────┐
         │                                                      │
         │  ▄▄                                                  │
         │                                                      │
         └──────────────────────────────────────────────────────┘




                                            │Copying: ccdecode.inf
```

Next setup will initialize the Windows 2000 configuration.

Once down setup will be required to reboot, make sure you have to floppies in the drives, and press "ENTER" to speed things up.

PART 3

Due to the Windows 2000 CD being in drive, the following message will appear "Press any key to boot from CD", do not press anything, just wait for the message to pass.

Windows install will start again.

Be patient.....

Sometimes it is best not watching.....

Now the setup wizard. (Mouse is now active) Press "NEXT" to continue.....

and now you get to wait again, be patient the "Installing Devices" part of the install can take forever.
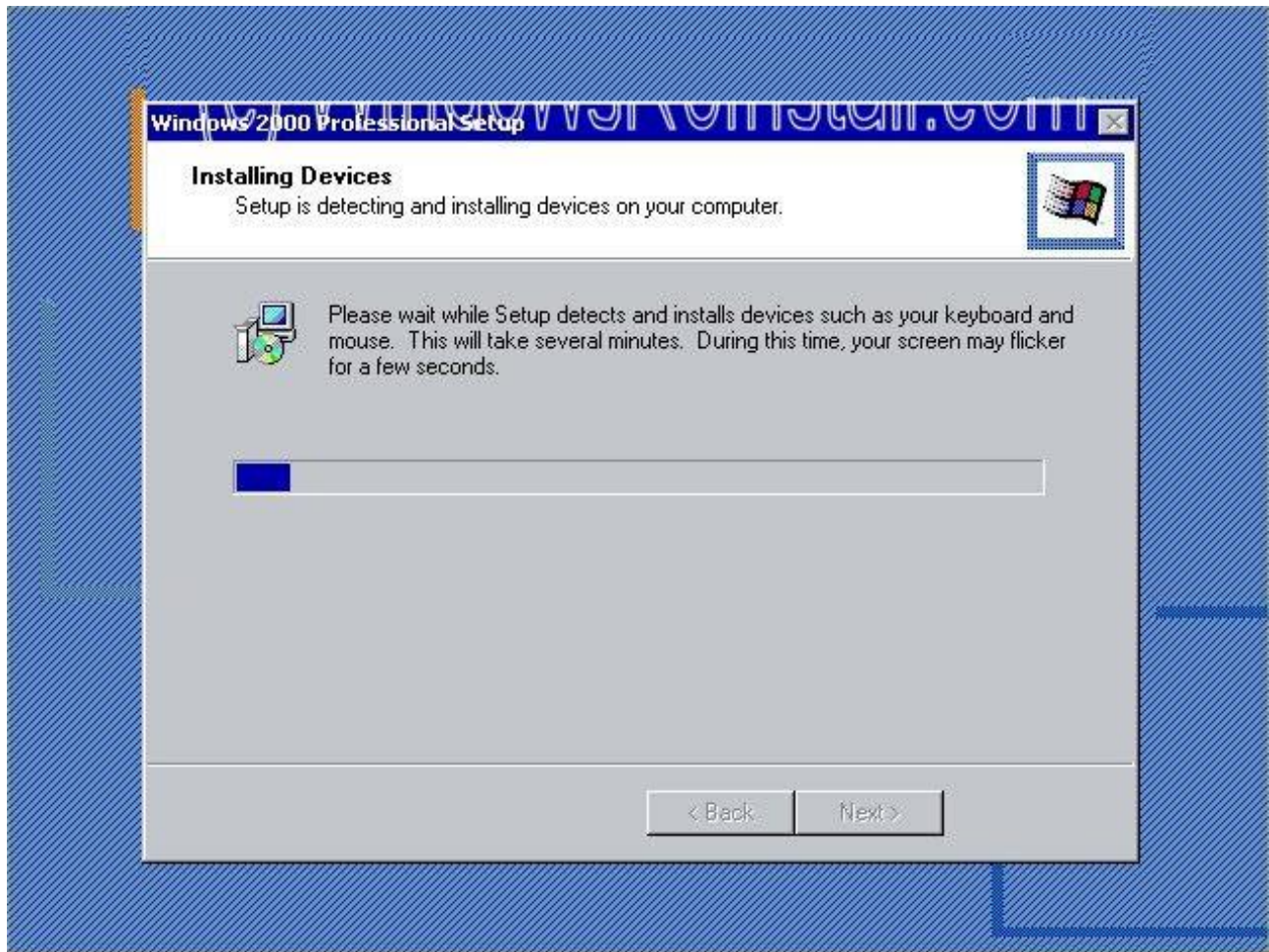
Now regional setup, click on the top customize.
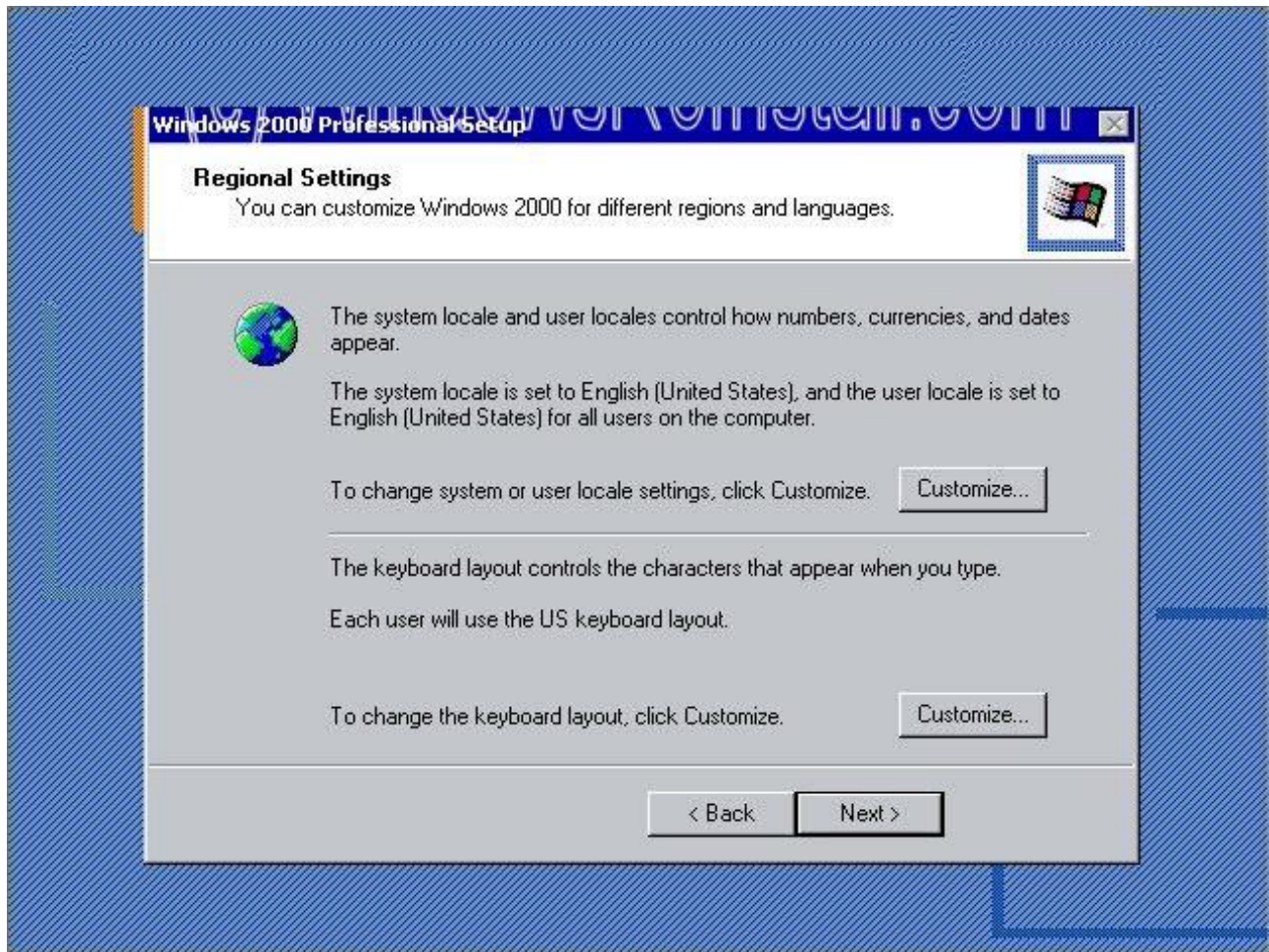
Change your Locale under General.

Regional Options

| General | Numbers | Currency | Time | Date | Input Locales |

English (United Kingdom)

English (United Kingdom)
English (United States)
English (Zimbabwe)
Faeroese
Finnish
French (Belgium)
French (Canada)
French (France)
French (Luxembourg)
French (Monaco)
French (Switzerland)
German (Austria)
German (Germany)

☐ Armenian
☐ Baltic
☐ Central Europe
☐ Cyrillic

Set default...   Advanced...

OK   Cancel   Apply

Add your Input Locale under "INPUT LOCALES" (Unless the one present is correct)
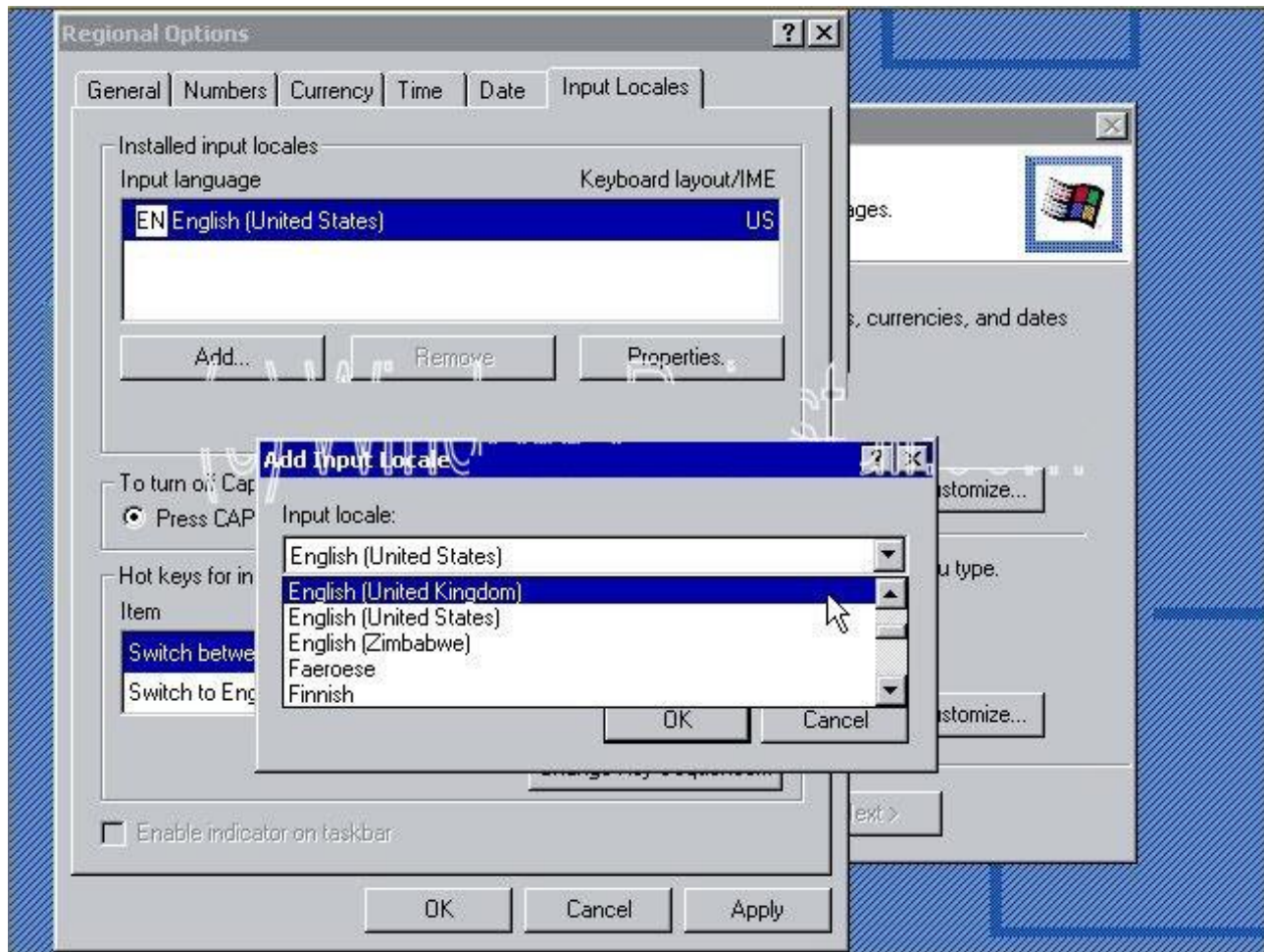
Delete the "Input Locale" you no longer want and click OK to continue and then "NEXT" once happy with settings. Don't worry though as all these settings can be configured in the Control Panel once in Windows.

Now input your Name and Organization.....
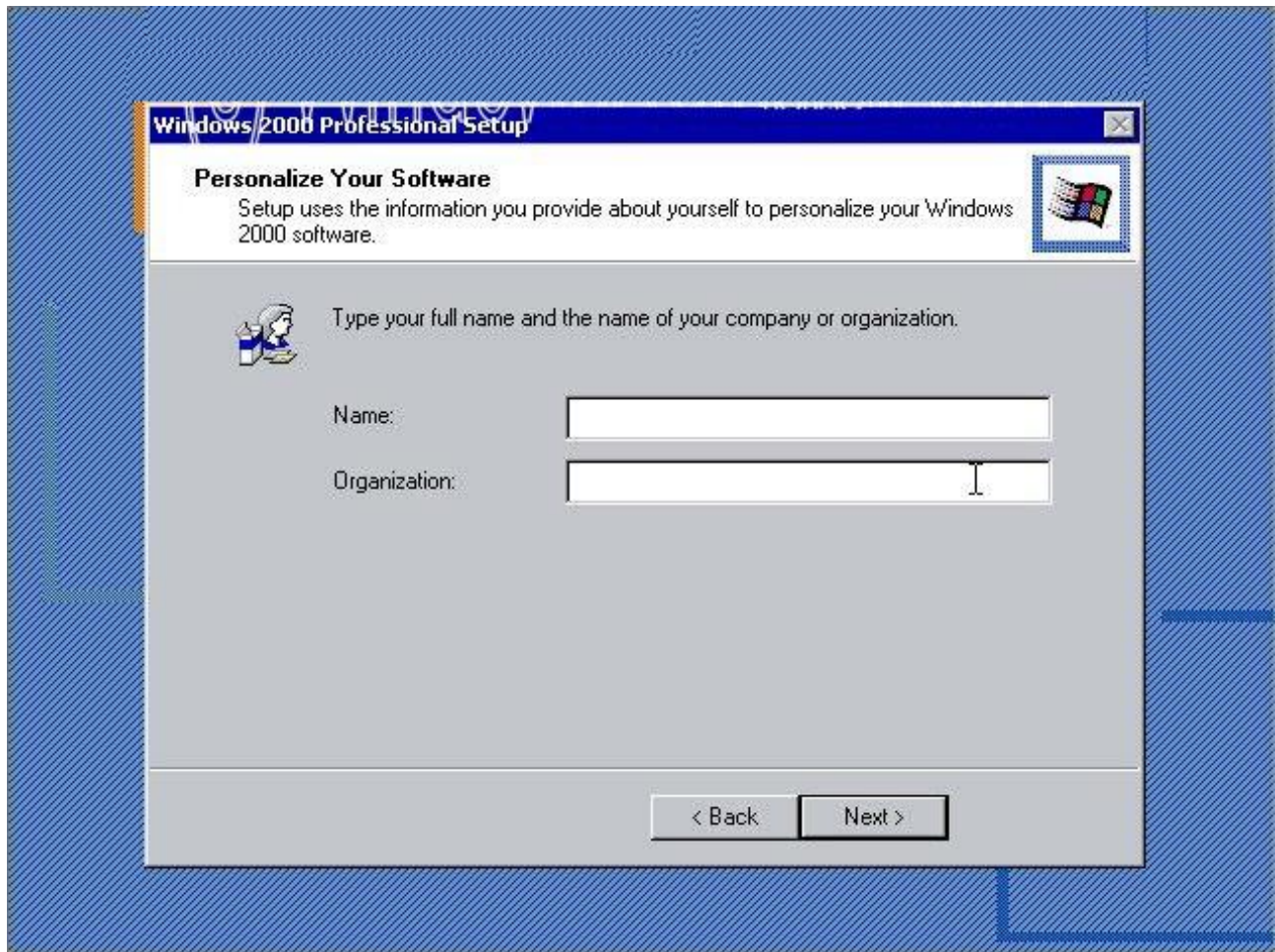
As we have done below, then click "NEXT" to continue.
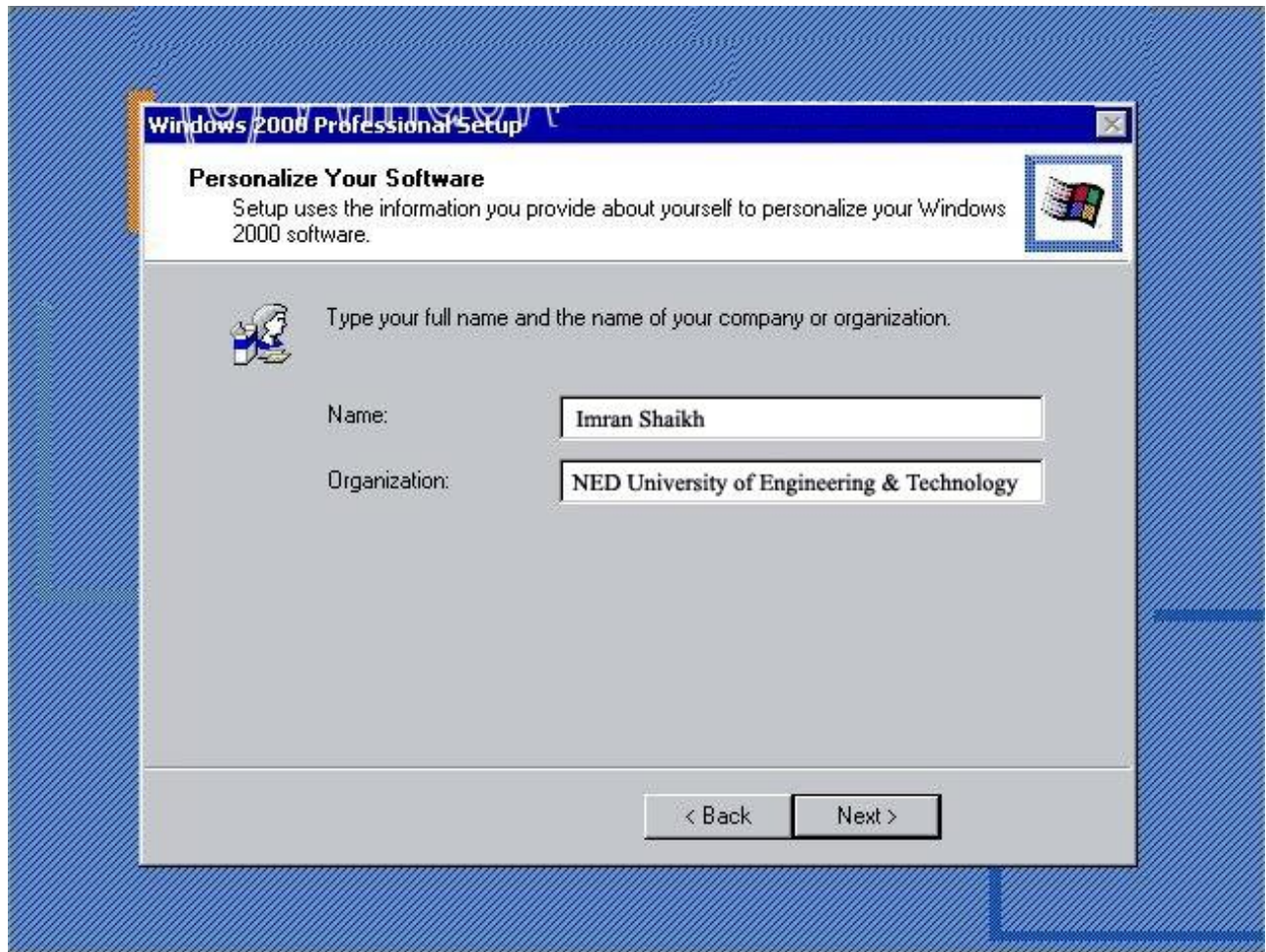
Now input your Product Key, this is 25 characters long and can be found in the Windows 2000 packaging or on the side or back of your machine. Click next to continue. If you get any errors then double check what you have inputted and make sure you have used the correct letters and numbers.
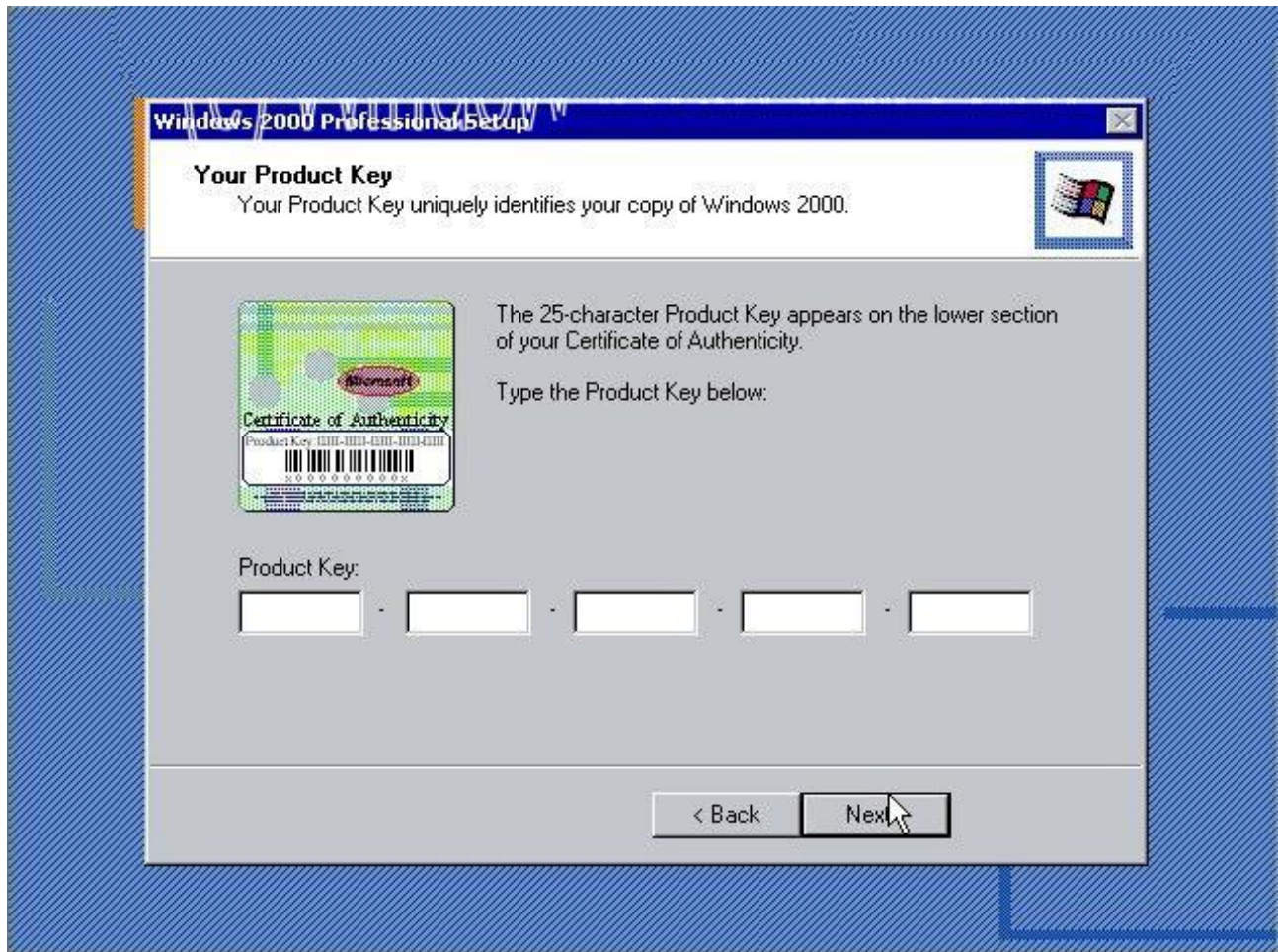
Now set you computer name (How it will be Identified on the network), and also set the administrator password, you will need to confirm this. Click "NEXT" to continue.

Next select your Time Zone to the area you are in. Then click "NEXT" to continue.
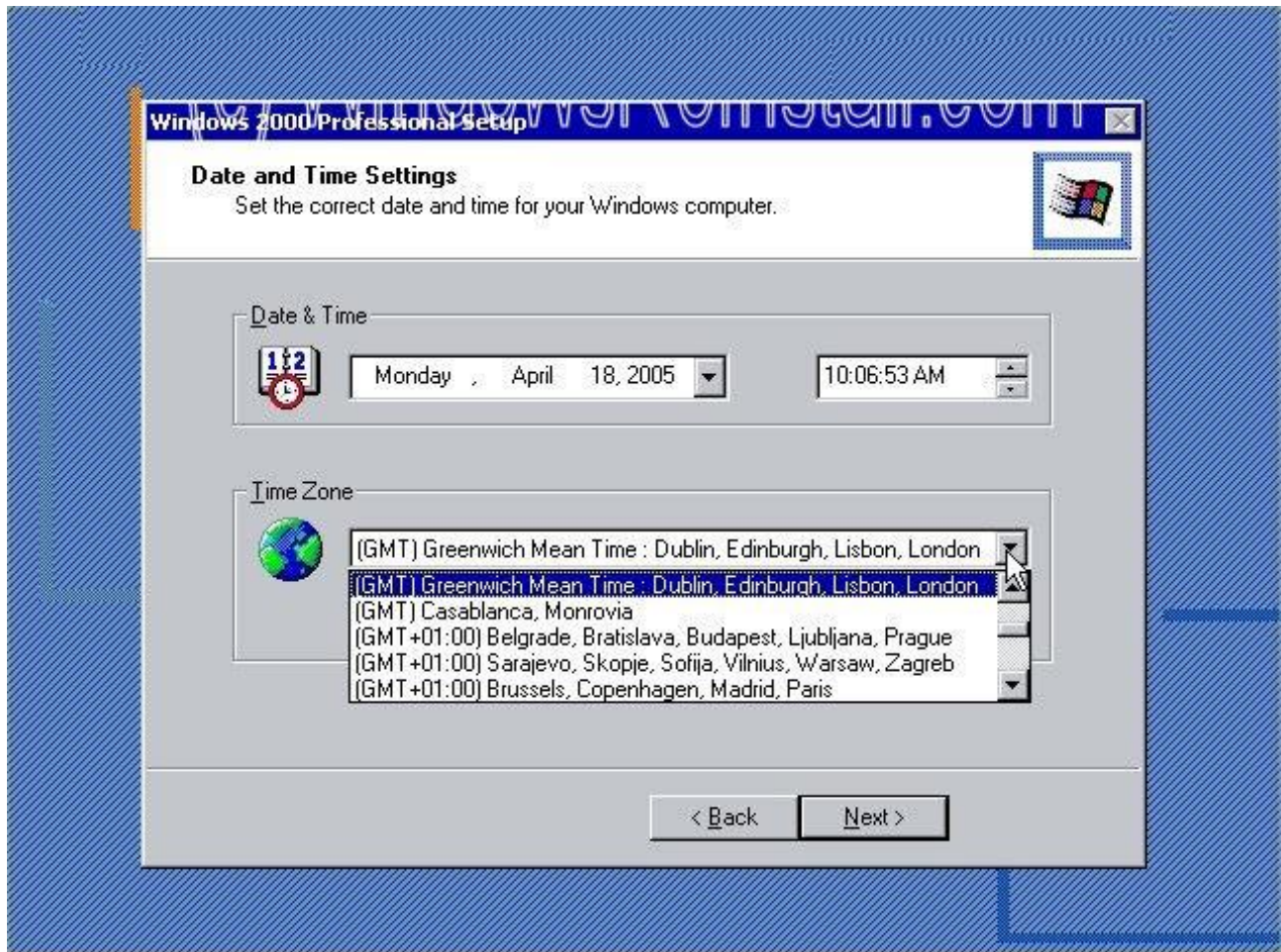
The Network will now install.
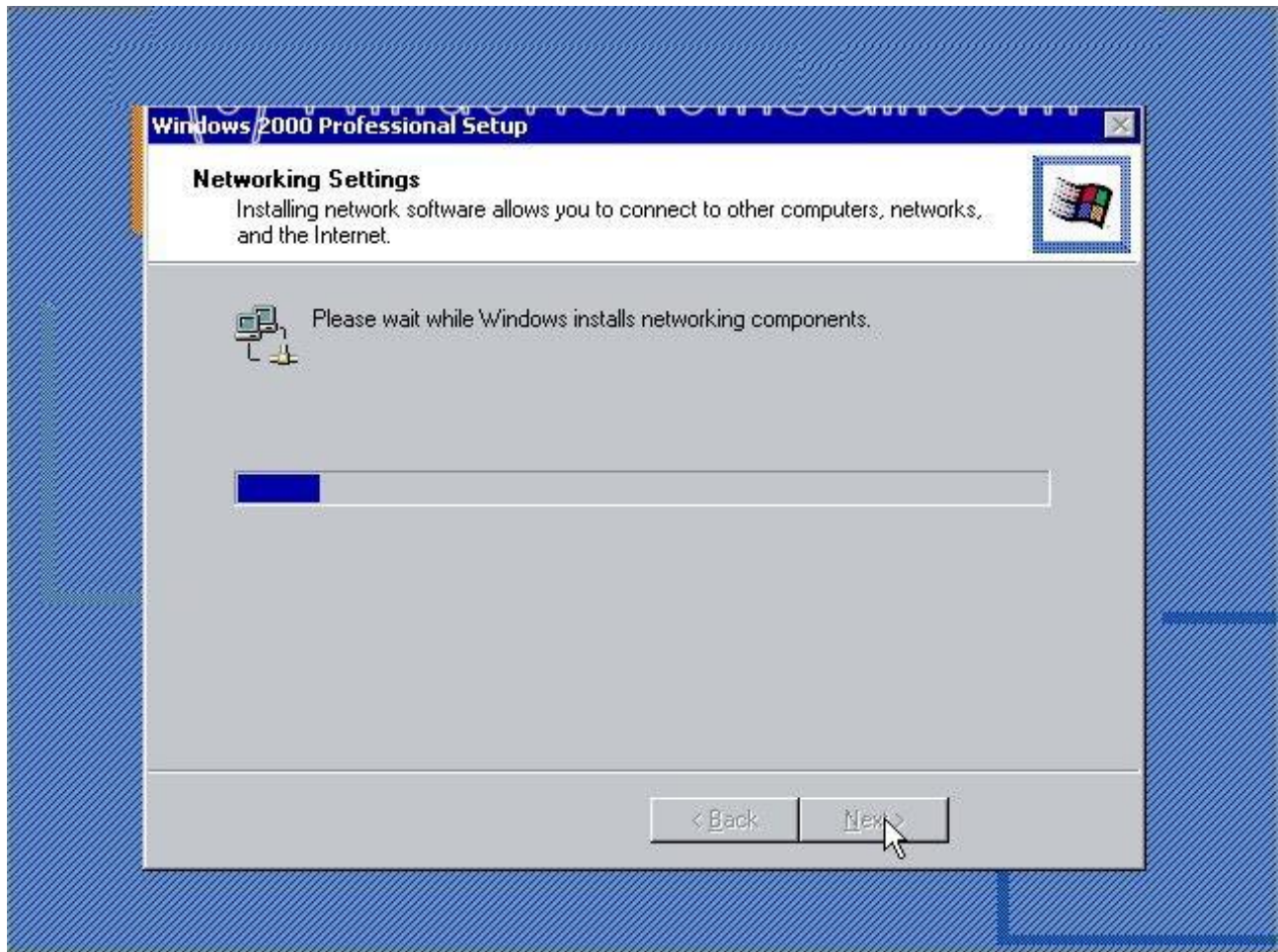
For Network settings, leave at typical and click next, these can be configured at a later date. Click "NEXT" to continue.
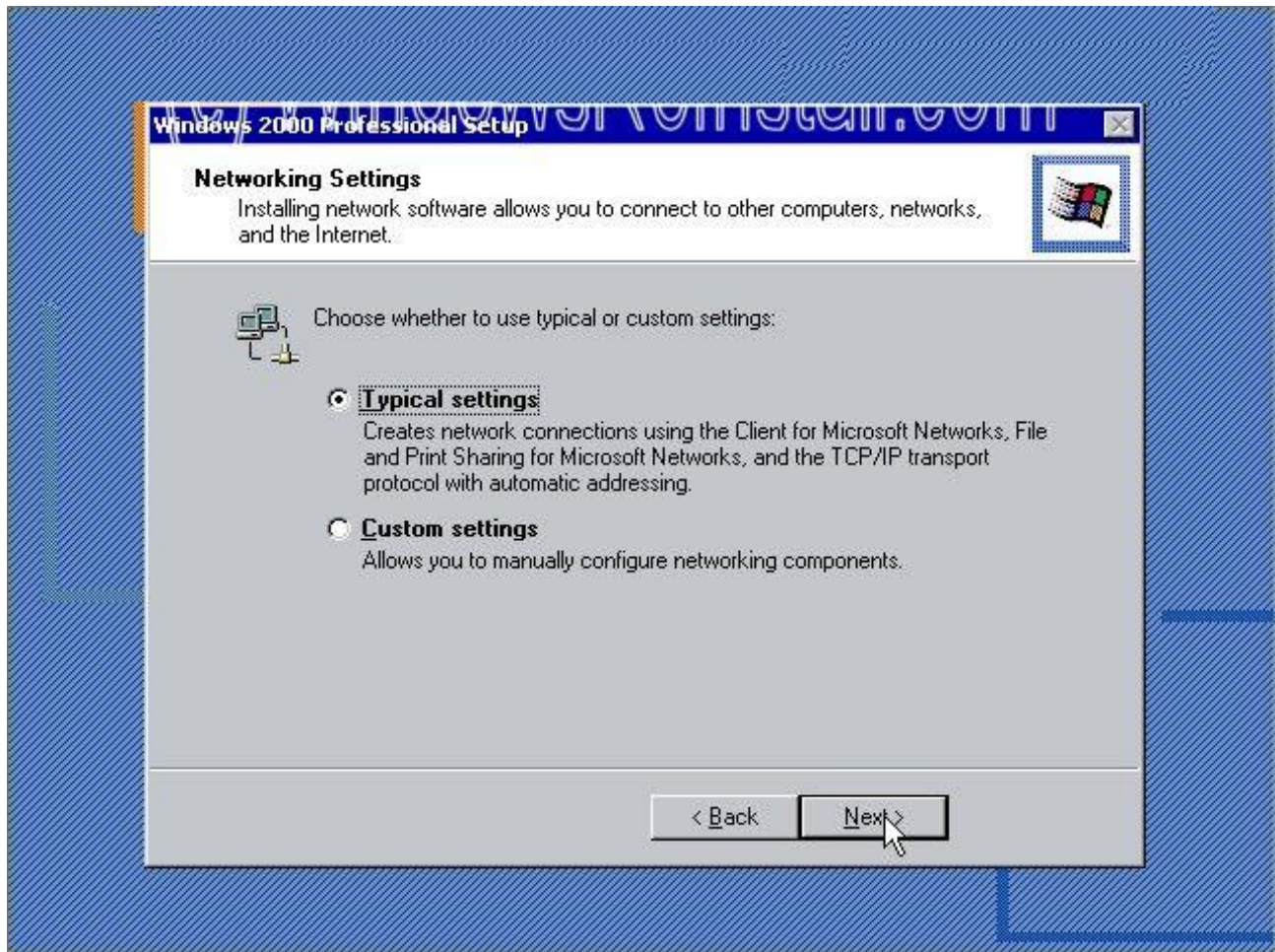
If your computer is on a network than click on "YES...." and input the workgroup name, otherwise leave at "NO..." and click "NEXT"
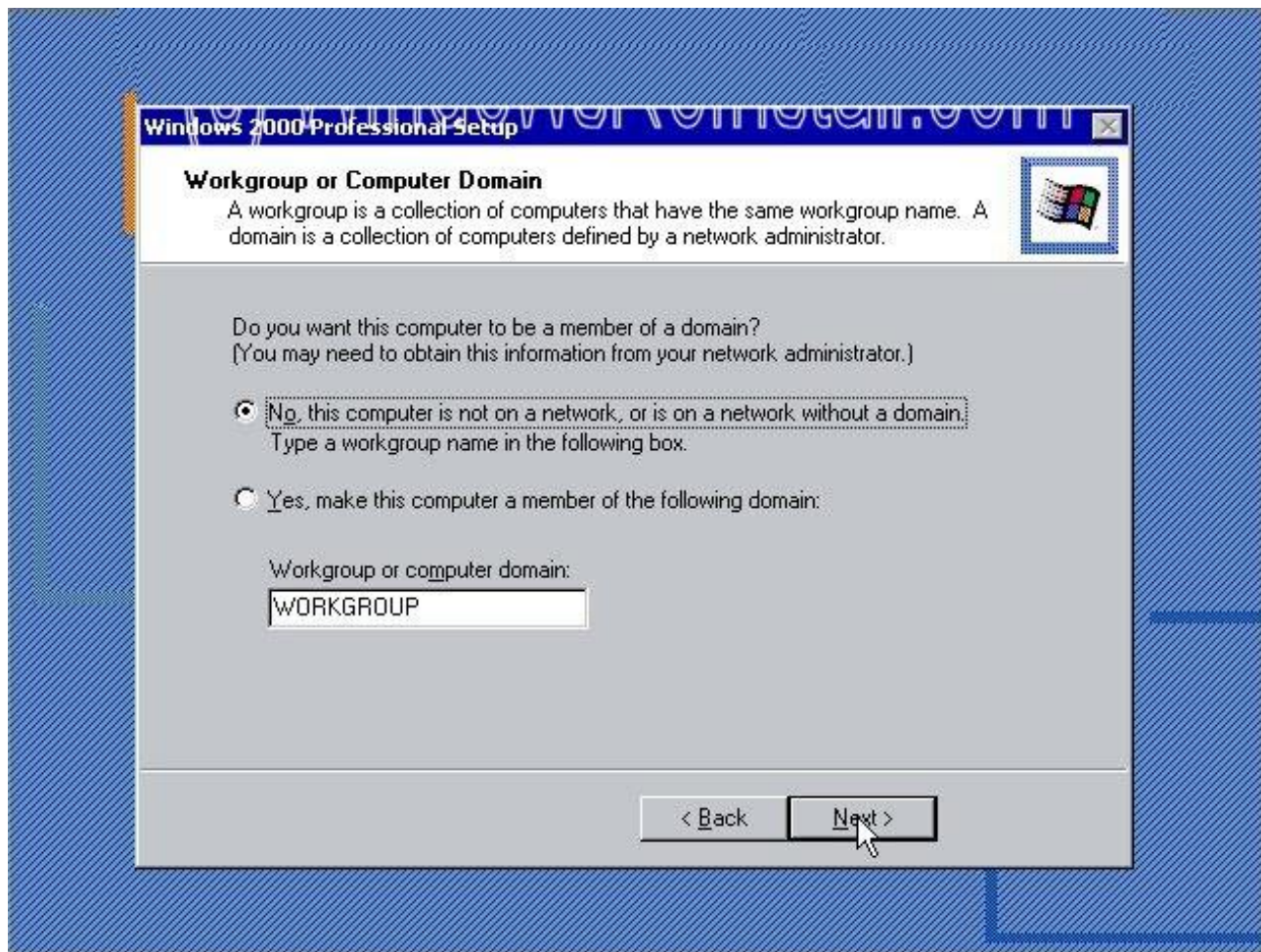
More components will now install.
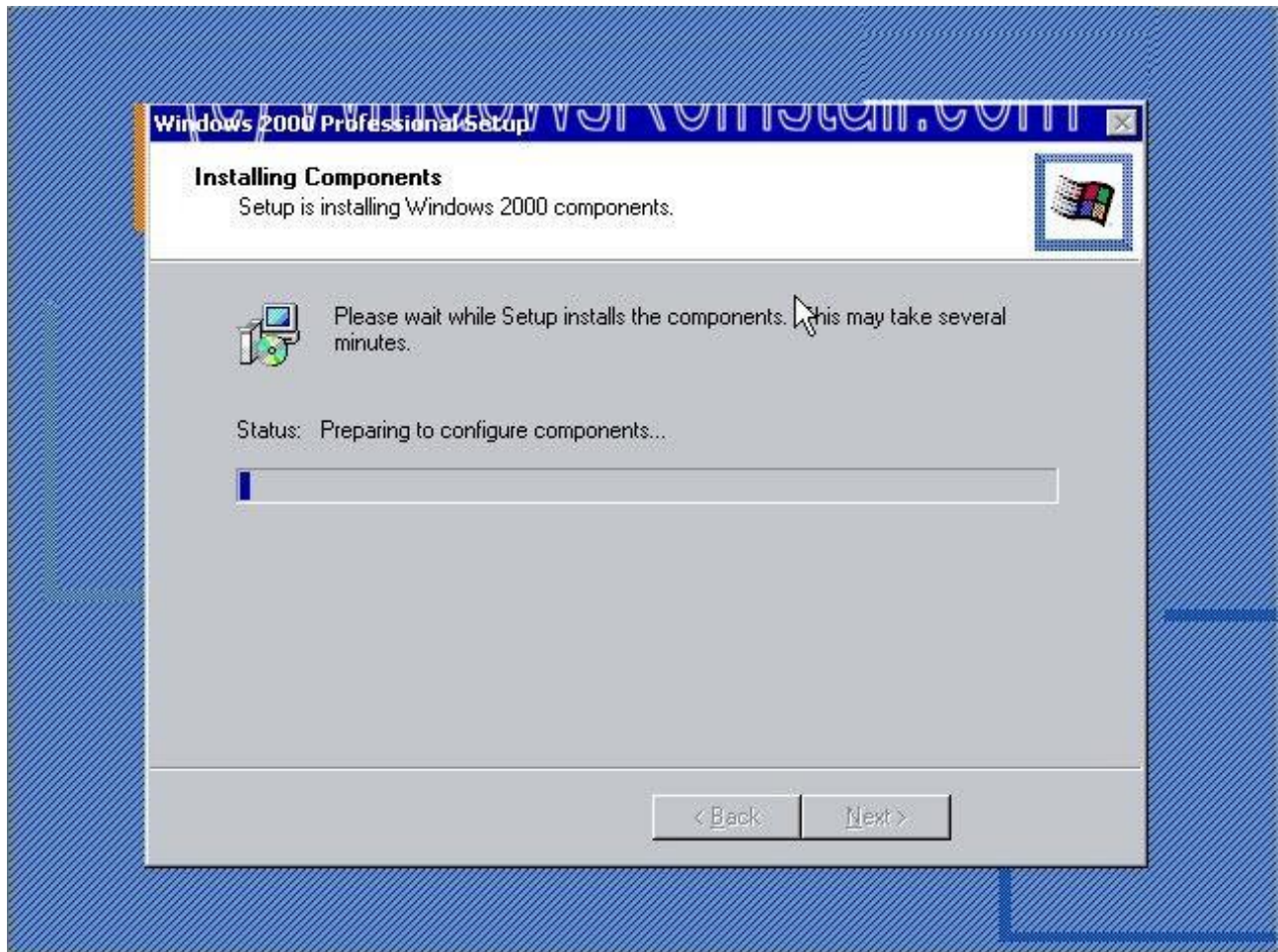
Next the Start menu, registry components....
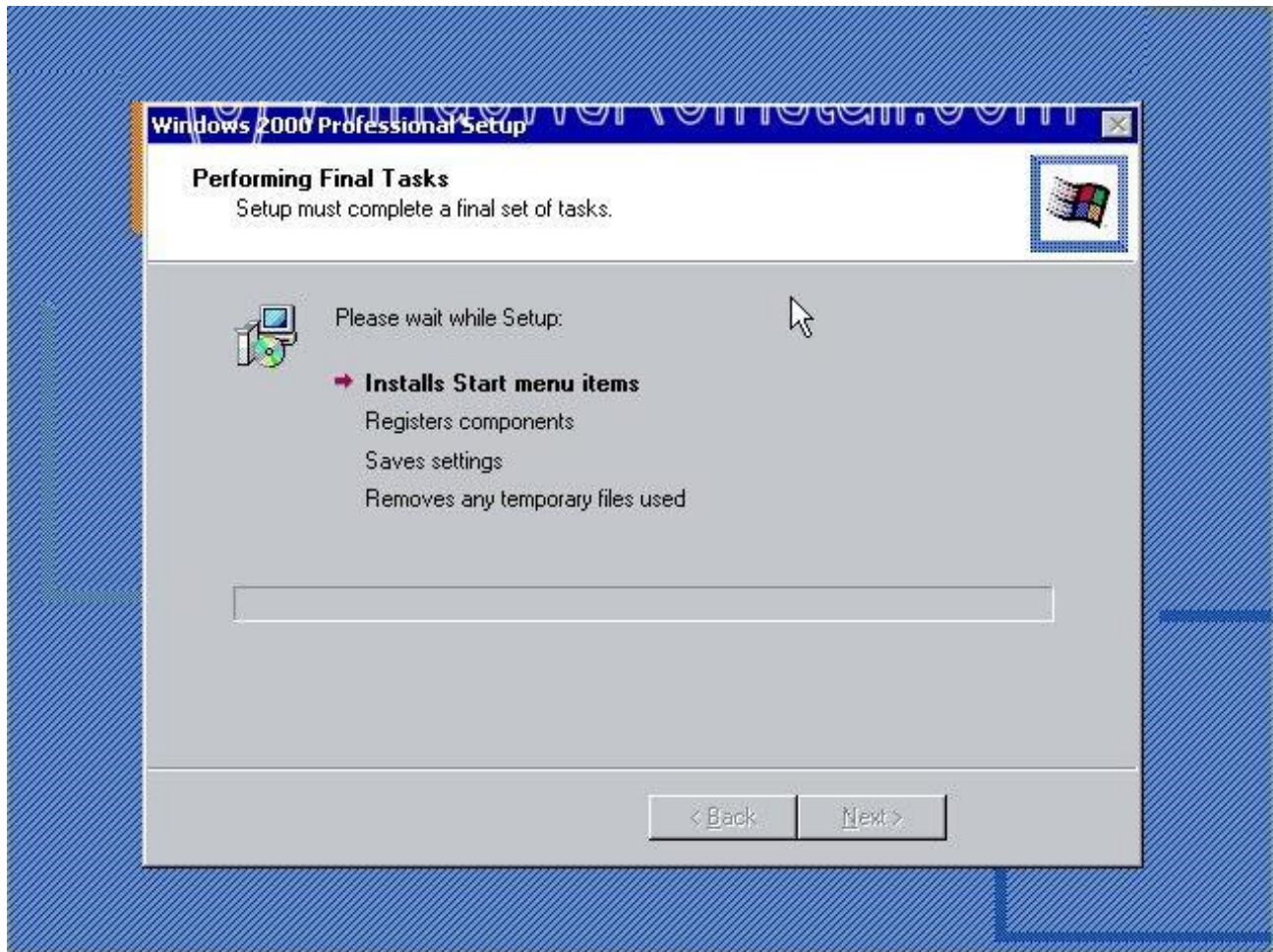
System will save settings and remove temp files....

and finally click on "FINISH" to complete the Windows 2000 install.

Windows will now continue to load....

and then reboot your computer for first boot. Due to the Windows 2000 CD being in drive, the following message will appear "Press any key to boot from CD", do not press anything, just wait for the message to pass.

Windows will continue to load for first time......
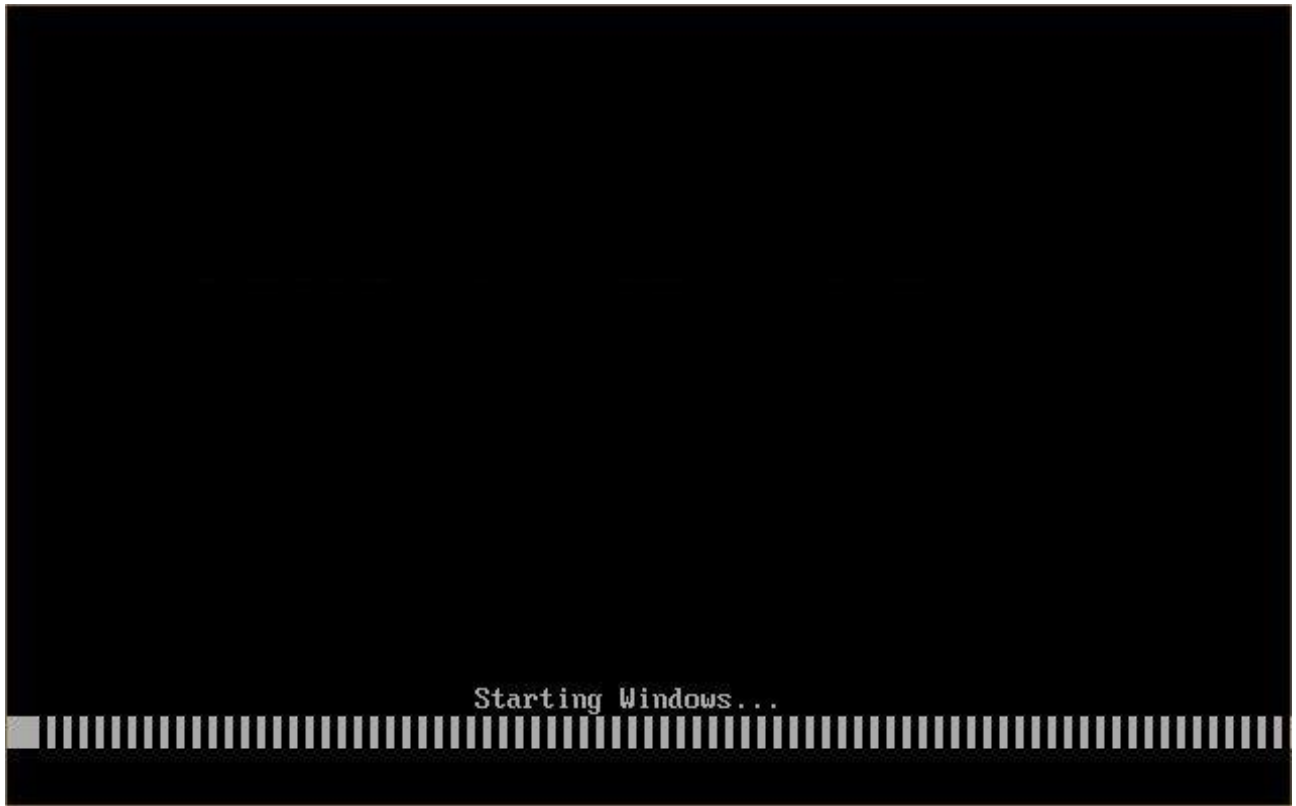
Starting Windows...

The Windows 2000 splash screen.
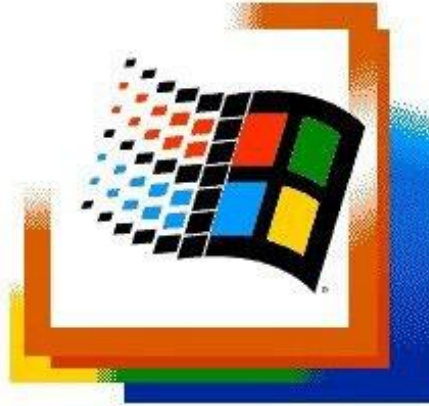
Now it begins starting.

Now the Network ID wizard will appear. Click "NEXT" to continue.

If you are using this computer on you own use "Windows always assume the following user...." option, This will create an account in the name you set previously in Personalize your computer. Set a password if need be.

If you have multiple users then select "Users must enter a user name and password...", this means you will have to log in as Administrator, then set up the user accounts from the Control Panel from within windows.

Click "NEXT" when finished.
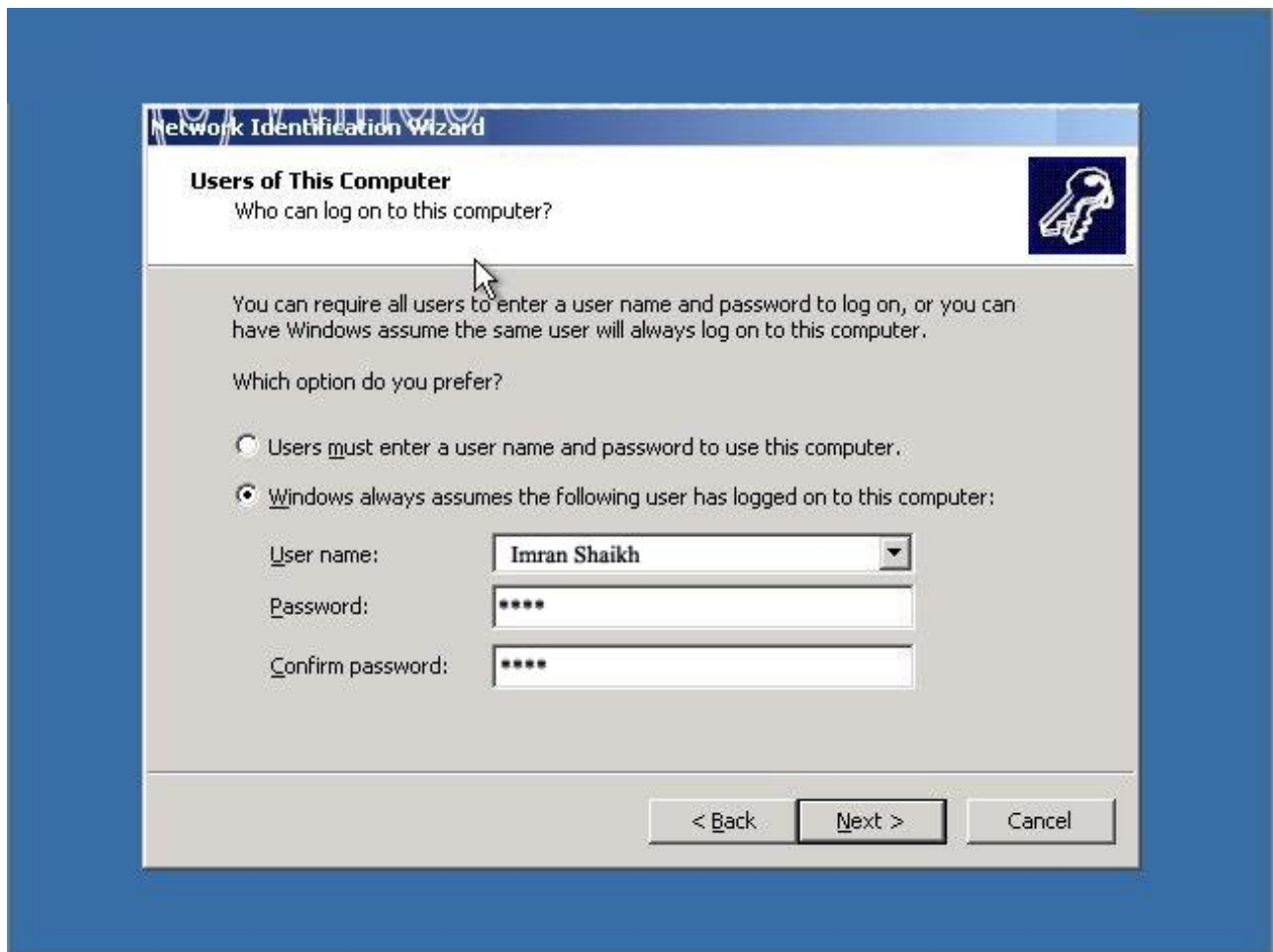
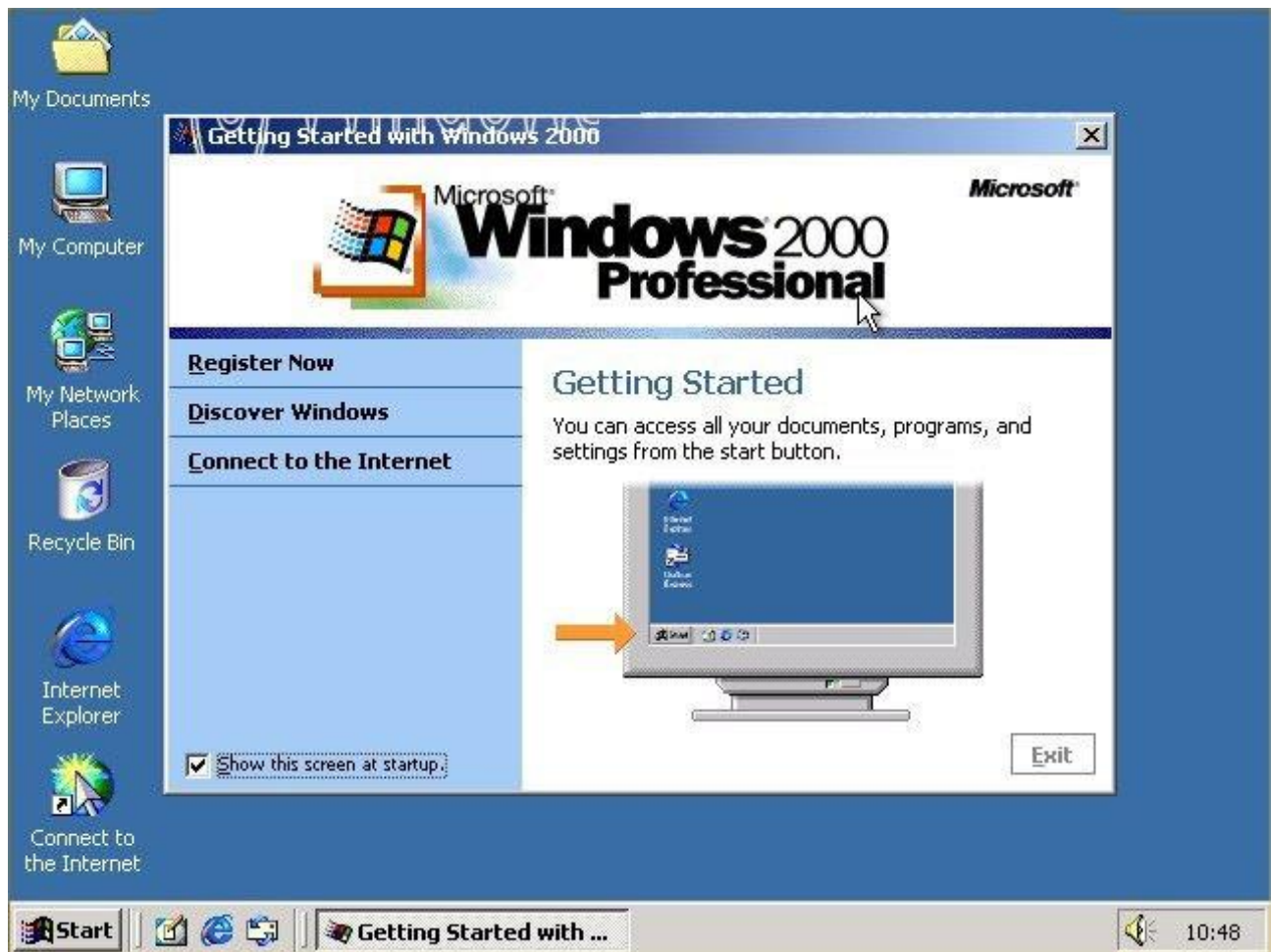Now complete the Network setup by clicking "FINISH".

Now the logon screen, this will vary depending on how you set the login, and if you set a password or not, you may need to use "CTRL ALT DEL" for the login as Administrator, if you didn't set a password then the system will login automatically as long as the "Windows always assumes...." option was selected.

This screen shot is the "Windows always assume the following user...." option

This screen shot is the "Users must enter a user name and password..." option

Once you have logged in you will arrive at the desktop, it is time to install drivers, setup network/internet, install service packs, setup user accounts, etc etc.

THE END