ANNOUNCING ...

AN A+ CERTIFICATION
DOS/WINDOWS/WINDOWS 95
EXAM REVIEW SESSION

WITH BILL LLOYD

Taking and passing the A+ PC Hardware Certification examination is a step towards establishing yourself in a career in the PC repair field. This day-long review session will help to prepare you to take the DOS/Windows/Windows 95 portion of the A+ examination.

This class will be hosted by Bill Lloyd, an A+ Certified PC Repair Technician, and teacher of the popular ENT 184/PC Hardware and ENT 284/PC Repair courses at Prince George's Community College.

The class will cover the following topics in the DOS/Windows/Windows 95 certification exam (and other important topics):

- Understanding .INI files
- Configuring Printers
- Understanding CONFIG.SYS
- Using MEMMAKER to optimize memory
- Using FDISK and FORMAT
- Differences between Win 3.1 and Win95
- Installing multimedia devices
- Registry files and REGEDIT
- Review session covering all test question subjects
- Using the Control Panel
- Installing Windows Applications
- Understanding AUTOEXEC.BAT
- Tips when re-installing Windows
- Using SCANDISK and DEFRAG
- Installing video drivers in Windows
- Installing Netscape and other browsers
- Configuring Plug&Play devices in Win95

Thank you for joining us for today’s class ... please let us know if there is anything we can do to make your learning experience more enjoyable.

Class will begin at 9:00AM ... there will be a morning and afternoon break, and an hour lunch break. The class will finish by 4:30PM today.

We will spend a portion of the afternoon covering the questions that will be asked on the DOS/Windows/Win95 portion of the A+ Certification examination. We will also provide information on where you can purchase a copy of the A+ practice examination.

Again, welcome to the class!

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USING THE FDISK AND FORMAT COMMANDS IN DOS AND WINDOWS 95

The FDISK Command

FDISK is used to create, erase, or view a partition table on a hard disk. Normally, you will use FDISK when you first prepare a hard disk for use, or when you wish to wipe all the data off of a disk and completely re-format the disk.

When running FDISK on a hard disk, you may choose to divide (or partition) the disk into one single partition, or into several smaller segments. Use this following procedure when creating a segmented hard drive: you will first create a Primary DOS partition (a bootable partition), and then make the partition active (informing the PC to attempt booting to the drive). Then, you will create an Extended DOS partition (a non-booting partition), and create logical drives within that partition (assigning drive letters to segments of the partition). You will then format the drive, individually formatting each partition on the disk. If you wish to remove the partitions at a later time, you will need to delete the logical drives, then the Extended DOS partition, then the Primary DOS partition in order to get back to a blank hard disk.

Re-writing the Master Boot Record

There is an undocumented feature in the FDISK command that allows you to re-write the Master Boot Record in the partition table WITHOUT destroying the data on the disk. You will use this command if you believe that a virus has damaged the partition table on the hard disk, and you want to attempt a rescue of the data before dumping the hard disk and reloading your operating system. This command is shown below:

```
FDISK /MBR
```

Once you run FDISK /MBR, you also may want to run the command SYS C: (Enter) to restore the boot files into the boot sector of the hard disk. Once you have performed both of these commands, power down the computer to wipe any potential virus from memory. Then, power up the computer and see if the system will boot to the hard disk. In many cases, this procedure will restore the hard disk to a booting state without a reformat and reload of the operating system.

Using FDISK With FAT32 in Windows 95 and 98

If you are using a boot disk from Windows 95-OSR2 or Windows 98, the version of FDISK that came with the operating system will allow you to create a disk partition larger than 2 gigabytes (2GB). Previous versions of DOS and Windows 95 would only support disk partitions up to 2GB in size. These large partition sizes are possible because the new version of FDISK creates an environment where a 32-bit file allocation table (or FAT) can be used by the operating system. You will know if you have the correct version of FDISK if you receive a fairly long explanatory message after invoking the FDISK utility from the DOS prompt. At the bottom of the message screen, there is a question that asks:

```
Do you wish to use large disk support? [Y/N]
```

If you answer "Yes" to this question, you will enable Win 95 or Win 98 to use a 32-bit FAT, and have a single disk partition larger than 2GB. Answering "No" will let you create a standard 16-bit FAT with partition support up to 2GB.

There will be a number of questions on the A+ exam that deal with how to use the FDISK utility to partition a hard disk.

NOTES
USING THE FDISK AND FORMAT COMMANDS IN DOS AND WINDOWS 95

The FORMAT Command

The DOS FORMAT command lets you format floppy or hard disks (and other media, such as ZIP drives). However, there are a number of options available that make the FORMAT utility more useful. Listed below are some of these options:

- **FORMAT C: /S /V** <br>Formats a hard disk, making it bootable; the /V switch lets you put a volume name on the disk
- **FORMAT A: /S** <br>Formats a floppy disk, making it bootable
- **FORMAT A: /F:360 /U** <br>Formats floppy disk to 360k in a 5.25” high density drive; the /U switch performs an unconditional format (without checking the disk media)
- **FORMAT B: /F:720 /U** <br>Formats floppy disk to 720k in a 3.5” high density drive.
- **FORMAT A: /Q** <br>Performs a quick format of a previously-formatted disk (also works on a hard disk).

Refer to the HELP utility in DOS, or your DOS documentation for a further discussion of the DOS FDISK and FORMAT utilities.

The A+ exam covers the different option switches in the FORMAT command, and it will also ask you how to create, erase and view partition tables with the FDISK command.

NOTES
USING DEFRAG AND SCANDISK

With DOS 6 and above (including Windows 95), Microsoft gives you 2 tools to improve the performance of your hard disk (or floppy disks): DEFRAG, and SCANDISK. Here’s what they do:

DEFRAG

- DEFRAG goes through your hard disk and finds the fragmented pieces of files throughout your disk, and re-orders them so that ALL of your files are in contiguous pieces. Fragmented files take longer to retrieve, and a badly fragmented hard disk slows down your PC.
- To run DEFRAG, simply type DEFRAG at the DOS prompt and press Enter. Select the disk you wish to defragment, and press Enter. It will tell you how much of your disk is fragmented, and it will tell you the recommended defragmenting procedure. Use DEFRAG’s recommended procedure, and you can watch DEFRAG re-order the files on the display screen. When DEFRAG is done, it will beep to signal you to exit the program.
- ONE WARNING: do NOT turn off the PC while DEFRAG is running, or else you will lose any files that are currently being re-ordered. Also, you may want to run SCANDISK before running DEFRAG, in order to remove any incomplete files or lost clusters left over from when your PC "locks up".
- You should run this on a busy PC every 6 months or so, or whenever you are doing routine maintenance on a PC.

SCANDISK

- SCANDISK allows you to repair defects on a floppy or hard disk. It will repair bad file allocation tables (FATs) and partition tables, check for bad sectors on the disk, allow you to recover lost clusters (files with no end-of-file markers), and it will take care of files that have invalid filenames.
- To run SCANDISK, simply type SCANDISK at the DOS prompt and press Enter. If you wish to run SCANDISK on a specific disk (say the A: drive), type SCANDISK A: and press Enter. It will check out the disk, repair any errors, and prompt you if there are serious problems.

Using these Programs in Windows 95 / 98

If you are a Windows 95 / 98 user, you will run DEFRAG and SCANDISK while in Windows 95; do not exit to the DOS prompt to run these programs. Running the DOS-based versions of these programs may create problems in Windows 95, especially if you are using long file names (names that exceed the DOS 8.3 file-naming convention). Both of these programs are available from the Start menu, under Programs, Accessories, System Tools.

You may notice that in Windows 95 and 98 that the DOS version of SCANDISK will run if your PC locks up, and is unable to shut down normally. Be very cautious about agreeing to SCANDISK's request to "fix" any problems found while examining your disk ... it's best to run the Windows-based version of the program once you are in Windows 95. If all SCANDISK wants to do is clean up temporary files or reclaim unused disk space, agreeing to the DOS-level SCANDISK’s repair request should be just fine.

As a general rule, run DEFRAG and SCANDISK on all PCs brought in for repair. These programs may alert you to the presence of other potential problems on your customer's PC, and may help you to diagnose the reported problems as well.

There will be specific questions on the A+ exam that deal with SCANDISK and DEFRAG, and exactly what these programs do for the user.
USING MEMMAKER TO OPTIMIZE MEMORY

With DOS 6.0 and above (but not Windows 95, 98 or NT), a utility called MEMMAKER was included to help you configure your conventional, reserved, extended and expanded memory areas in the most efficient manner possible for your PC. Here's how it works:

- It looks at the drivers and software that are being loaded in your CONFIG.SYS and AUTOEXEC.BAT files;
- it determines how memory is needed to load the drivers,
- it determines how much memory is available to load drivers in the Upper Memory Block (between 640k and 1MB) and the High Memory Area (the first 64k of extended memory);
- then, it uses the DEVICEHIGH and LOADHIGH (LH) statements to load programs and drivers into the UMB and HMA, thereby ensuring that your DOS and Windows programs have sufficient conventional memory (between 0k and 640k) to run properly.

If you are running DOS 6.x and you have less than 560k of your first 640k of memory free, you should run MEMMAKER. Also, anytime you install a new device that requires a device driver (like a sound card, a scanner, etc.), you should run MEMMAKER to make sure your memory is optimized properly.

How do I run MEMMAKER?

At the DOS prompt, type MEMMAKER and press Enter. The program will do the rest.

- It will re-boot your computer, using a program called SIZER to determine the size of your driver software programs.
- Then, it will compute the most efficient way to load these drivers and programs into the UMB and HMA regions of memory.
- Then, it will re-write your CONFIG.SYS and AUTOEXEC.BAT files, loading these driver programs into specific regions of the UMB or HMA.
- Finally, it re-boots your computer, and if all goes well, MEMMAKER asks you "Does your PC appear to be working properly?". If you get to this screen, then your memory has been optimized correctly. Answer "Yes", and MEMMAKER will then show you how much memory is being used for your drivers, and how much conventional memory is now available for your programs.

What happens if MEMMAKER locks up my PC?

Occasionally, MEMMAKER will try to load a driver into a memory area that is being used by some device. When that happens, the PC locks up or freezes when running certain programs.

- If this happens, re-run MEMMAKER with the /UNDO switch (this undoes the changes made by MEMMAKER), and try to re-run MEMMAKER normally again. Usually, this fixes the problem.

Also, MEMMAKER may lock up as it is trying to assess the sizes of your driver programs.

- If this happens, reboot your PC. MEMMAKER will give you a message explaining the error. You will have 2 choices: "Try again with conservative settings", or "Cancel and undo all changes". Use the "conservative settings" option first before cancelling the optimization process.

Consult your DOS manual or the HELP facility in DOS to answer any further questions about MEMMAKER.

NOTE: The example CONFIG.SYS and AUTOEXEC.BAT files found on the next two pages will provide optimum conventional memory management for Windows 95 and 98 users. Since you can't run MEMMAKER in Windows 95 or 98, use these examples as a guide for maximizing your conventional memory space.

There will be question on the A+ exam about what MEMMAKER does, and how to invoke the program.
## A TYPICAL CONFIG.SYS FILE

<table>
<thead>
<tr>
<th>DOS Commands</th>
<th>Explanation of DOS Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Menu]</td>
<td></td>
</tr>
<tr>
<td>MENUITEM=YCDROM, Load CD-Rom Drivers</td>
<td>Displays &quot;multi-boot&quot; menu</td>
</tr>
<tr>
<td>MENUITEM=NCDROM, Do NOT Load CD-ROM Drivers</td>
<td>Multi-boot option #1</td>
</tr>
<tr>
<td>MENUDEFAULT=NCDROM, 10</td>
<td>Multi-boot option #2</td>
</tr>
<tr>
<td>[Common]</td>
<td></td>
</tr>
<tr>
<td>DEVICE=C:\DOS\HIMEM.SYS</td>
<td>Extended memory driver</td>
</tr>
<tr>
<td>DEVICE=C:\DOS\EMM386.EXE NOEMS</td>
<td>Expanded/UMB memory driver</td>
</tr>
<tr>
<td>DOS=UMB</td>
<td>Loads DOS kernel in UMB area</td>
</tr>
<tr>
<td>DOS=HIGH</td>
<td>Loads DOS kernel in High Memory Area (if needed)</td>
</tr>
<tr>
<td>BUFFERS=10,0</td>
<td>Creates 10 512-byte disk cache buffers</td>
</tr>
<tr>
<td>FILES=50</td>
<td>Creating a 50-line table to keep track of up to 50 files loaded in memory</td>
</tr>
<tr>
<td>FCBS=4,0</td>
<td>Creates 4 &quot;look-ahead&quot; buffers, used for program branching/prediction</td>
</tr>
<tr>
<td>STACKS=9,256</td>
<td>Creates 9 256-byte stacks to hold information when devices are interrupted</td>
</tr>
<tr>
<td>DEVICEHIGH /L:1,9072 =C:\DOS\ANSI.SYS</td>
<td>Loads ANSI video screen driver</td>
</tr>
<tr>
<td>DEVICEHIGH=C:\DOS\SETVER.EXE</td>
<td>Allows older DOS programs to work with newer versions of the operating system</td>
</tr>
<tr>
<td>DEVICEHIGH=C:\WINDOWS\IFSHLP.SYS</td>
<td>Program that supports Windows networking environment</td>
</tr>
<tr>
<td>SHELL=C:\COMMAND.COM /E:1024 /P</td>
<td>Explicitly states name of command processor; sets environment size to 1024 bytes (instead of default 128 bytes)</td>
</tr>
<tr>
<td>LASTDRIVE=F</td>
<td>Explicitly states last logical drive in system</td>
</tr>
<tr>
<td>[YCDROM]</td>
<td></td>
</tr>
<tr>
<td>DEVICEHIGH=C:\MTMCDAL.SYS /D:MSCD001 /P:170,15</td>
<td>Loads CD-ROM driver (when user indicates in menu to load driver)</td>
</tr>
<tr>
<td>[NCDROM]</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** In Windows 95 and 98, pressing F8 at boot-up will cause Windows to display a generic "multi-boot" option screen. Use this whenever diagnosing or trouble-shooting boot-up problems.
### A TYPICAL AUTOEXEC.BAT FILE

<table>
<thead>
<tr>
<th>DOS Commands</th>
<th>Explanation of commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>@ECHO OFF</td>
<td>Commands will not be displayed to the screen as they are executed</td>
</tr>
<tr>
<td>CALL C:\NWCLIENT\STARTNET.BAT</td>
<td>Loads Novell IPX &amp; NETX (or IPX and VLM)</td>
</tr>
<tr>
<td>PROMPT $PG</td>
<td>Prompt definition</td>
</tr>
<tr>
<td>PATH=C:\WINDOWS;C:\DOS;C:;C:\NWCLIENT;</td>
<td>Path definition</td>
</tr>
<tr>
<td>:YCDROM</td>
<td>&quot;YES&quot; path to load CD-ROM driver</td>
</tr>
<tr>
<td>LH C:\DOS\MSCDEX.EXE /D:MSCD001 /M:10 /L:R GOTO CONT</td>
<td>Loads CD-ROM driver; makes CD-ROM drive appear as R:\ &gt;</td>
</tr>
<tr>
<td>:NCDROM</td>
<td>Path if CD-ROM driver is not to be loaded</td>
</tr>
<tr>
<td>:CONT</td>
<td>Main part of AUTOEXEC.BAT</td>
</tr>
<tr>
<td>LH /L:0;1,16400 /S C:\DOS\SMARTDRV.EXE</td>
<td>Disk caching program</td>
</tr>
<tr>
<td>LH /L:2,6384 C:\DOS\DOSKEY</td>
<td>Lets you repeat last 20 DOS commands</td>
</tr>
<tr>
<td>SET MOUSE=C:\MSMOUSE</td>
<td>Sets MOUSE memory variable</td>
</tr>
<tr>
<td>LH C:\MSMOUSE\MOUSE</td>
<td>Loads mouse driver</td>
</tr>
<tr>
<td>SET TEMP=C:\TEMP</td>
<td>Specifies location for temp files</td>
</tr>
<tr>
<td>SET RES=VGA</td>
<td>Sets RES memory variable</td>
</tr>
<tr>
<td>CLS</td>
<td>Clears the screen</td>
</tr>
<tr>
<td>C:\NET\BIN\WGTCPIP.EXE -C=C:\NWCLIENT\NET.CFG</td>
<td>Loads Novell TCP/IP driver</td>
</tr>
<tr>
<td>ECHO.</td>
<td>Displays blank line on screen</td>
</tr>
<tr>
<td>ECHO.</td>
<td>Displays another blank line.</td>
</tr>
<tr>
<td>F:LOGIN DSD1\</td>
<td>Logs into Novell server called DSD1</td>
</tr>
</tbody>
</table>

#### Changes for Windows 95 and 98

In Windows 95 and 98, the lines for MSCDEX.EXE, SMARTDRV.EXE and MOUSE.EXE will be remarked out of the AUTOEXEC.BAT file ... Windows 95 has built-in 32-bit driver support for these programs, and the 16-bit (real mode) drivers do not need to be loaded at a DOS level.

Also, in Windows 95 and 98, pressing F8 at boot-up will cause Windows to display a generic "multi-boot" option screen. Use this whenever diagnosing or trouble-shooting boot-up problems.
WHAT MAKES A MULTIMEDIA PC?

Several things are necessary to make a PC into a Multimedia class of PC:

1) At least an 80386DX CPU, preferably an 80486DX CPU or better.

2) An SVGA class video card capable of displaying a minimum of 256 colors on the screen at one time, having a minimum of 1MB of video RAM;

3) A CD-ROM drive, at least a double-speed drive that is XA-ready, Kodak Photo CD ready, multisession-capable, and has at least a 300KB sustained data transfer rate (a double-speed CD-ROM drive);

4) A sound card of some kind, one that is Sound Blaster/AdLib compatible (I STRONGLY recommend using a true Creative Labs Sound Blaster card whenever possible);

5) Windows 3.1, Windows 95 / 98, OS/2 Warp, Windows NT, or some operating system/environment that will access and use CD-ROM drives and configure for sound cards.

6) In a DOS environment, you must load the DOS program MSCDEX.EXE, which enables MS-DOS to utilize a CD-ROM. In Windows 95 / 98, this program is built into the kernel of Windows.

7) In a DOS environment, you must load a driver program for your sound card so that it will work with DOS. Some sound cards have drivers that work EXCLUSIVELY with Windows, and NOT in a DOS environment.

8) A mouse, to make the graphical environment of Windows or OS/2 easier to use.

In a Windows 3.1 environment, 4MB of RAM is necessary to make a PC multimedia-ready. However, in most newer operating systems, a minimum of 16MB of RAM (if not 32MB) is needed to make the operating system and multimedia applications run at expected performance levels.

The A+ exam will have questions that relate to the MPC2 (Multimedia PC 2) standard. The type of computer listed above meets this industry standard, and the questions on the exam ask what would be needed to make a computer multimedia capable.

NOTES
HOW TO INSTALL A CD-ROM DRIVE IN YOUR PC

1) Install the SCSI host adapter (OR CD-ROM interface card) in a free bus connection on your PC. Note that some older CD-ROM drives (like Mitsumi and Creative Labs) are NOT SCSI, but have their own proprietary interface.

MOST non-SCSI CD-ROM drives available today use the ATAPI interface, which is another name for the IDE interface used in most hard drives. With these drives, you can plug your CD-ROM drive into the same cable as your hard drive. Make sure to set properly the master/slave jumpers when installing IDE-based CD-ROM drives.

2) Set the SCSI ID jumpers on your CD-ROM drive (if it's a SCSI drive), THEN install it into your PC's case; usually you will set the drive to ID #0, or #1 (depending on if you have another SCSI device in your PC already). Remember to attach the SCSI data cable and power cable.

If you have an IDE CD-ROM drive, plug the drive into the primary (or secondary) IDE interface cable. Be sure to orient the cable so the colored stripe is closest to pin 1 on the drive's cable connector. Set the master/slave jumpers on the CD-ROM drive to the slave setting; you may or may not need to set the PC's hard drive to master, though.

If you have a non-SCSI CD-ROM drive (a proprietary interface), set the IRQ, DMA channel and port address jumpers on the interface card (or sound card that contains the CD-ROM interface) to a setting where the interface will not conflict with other devices in your PC.

Standard interrupt levels for a CD-ROM device are IRQ 10 or 11; standard DMA channel assignments are DMA 5, 6 or 7; standard port addresses are either 300 Hex or 340 Hex.

3) Connect the audio cable from the CD-ROM drive to the sound card (or drive interface card).

4) Run the installation program that came with your CD-ROM drive; it will edit your CONFIG.SYS file to load the driver program needed to recognize the drive at the correct IRQ level, DMA channel and port address. Also, the installation program will load a program from your AUTOEXEC.BAT file called MSCDEX.EXE; this is the MS-DOS extension driver for CD-ROM drives that allows MS-DOS to use the drive.

5) Re-boot your PC; it should now recognize your drive.

6) Once the drive is working, get a print-out of your CONFIG.SYS file for safe-keeping. Some software installation programs may change your CONFIG.SYS file, and accidentally render your drive inoperative! Have that copy hidden somewhere for safe-keeping.

7) You may now replace the lid on your PC's case: the drive is ready for use.

8) Be sure to keep your documentation handy; strange things often occur when using CD-ROM drives and their associated software.

NOTE: If you have a CD-ROM that uses the older proprietary interfaces (like the Panasonic or Sony interfaces), REPLACE THE DRIVE AT YOUR EARLIEST CONVENIENCE. Even though Windows 95 still supports these obsolete CD-ROM interfaces, their performance will be no better than a 2x drive, and you will need a faster CD-ROM drive to keep up with today's computing needs.

There will be specific questions on how to install devices like CD-ROM drives and sound cards on the A+ examination; these questions will be in multiple choice format, and will present you with a number of options.
HOW TO INSTALL A SOUND CARD IN YOUR PC

1) Run a program like MSD.EXE or Checkit to find out what free interrupts you have in your PC BEFORE you install the sound card.

2) Read the manual for the sound card to see what interrupt level, DMA channel and port addresses you can use for the card; then set the IRQ and port address jumpers (if necessary) for the sound card. (NOTE: some sound cards have their resources set by software, rather than by moving a physical jumper or switch; see your manual for details.) Most cards comes factory configured the "proper way".

   Standard IRQ settings are IRQ 7 or 5; standard DMA channels are DMA 1 AND 5 (a sound card will use 2 DMA channels); standard port addresses are 220 Hex, and also 330 Hex for the MIDI interface found on most sound cards.

3) NOW install the sound card.

4) Run your installation program for the card to load the software drivers that will enable the card to operate. If you are using Windows 95 or 98, the sound card will likely be detected by the Plug-and-Play software manager. By putting the sound card install disk into the floppy (or CD-ROM) drive, the Windows Install Wizard should be able to finish the installation process for you and restart your system.

5) Attach your speakers to the sound card. You will need external speakers for your sound card, and these speakers will cost anywhere between $20 and $50.

6) Run the test program that comes with your sound card; make sure it sounds right. If there is no test program, simply use the features in Windows 95 / 98 to generate some sounds (play .WAV files from the Sound icon in the Control Panel, play an audio CD in your CD-ROM drive, play back a MIDI music file like CANYON.MID, etc.).

7) If the sound is scratchy, you may find you have a problem with one of the DMA chips (there are 2 in an AT-class PC) on your motherboard. Consult your sound card manual for troubleshooting suggestions.

8) If you have an older CD-ROM drive with a proprietary interface, make sure your sound card and your CD-ROM drive interface card work together well; some sound cards conflict with each other and will cause one or both to malfunction. If this is the case, contact the manufacturer for assistance. You may need to replace the card with a different brand if the problem can't be solved.

9) Test the sound card in Windows; the installation program should have created a program group that has audio utilities, and it should have modified Windows to play sounds. You should also be able to play audio CDs through your sound card (and CD-ROM drive) while in Windows. THEN, test the card in the DOS environment and make sure the card works there as well. Refer to the sound card's owners manual for details of how to resolve any problems.

There will be specific questions on how to install devices like CD-ROM drives and sound cards on the A+ examination; these questions will be in multiple choice format, and will present you with a number of options.

NOTES
UNDERSTANDING .INI FILES IN WINDOWS

What is an .INI file?

An .INI file is used by Windows (and Windows 95 to some degree) to set the initialization and operating parameters for any Windows-based program. In other words, an .INI file tells Windows what supplementary files are needed to run the program, where the files are located, what type of hardware is in your computer (i.e., video card, sound card, CD-ROM, scanner, mouse, etc.), and so forth. .INI files tell Windows programs what and how to load, and how to look and operate.

Windows 95 and 98 uses the Registry primarily to do the job that .INI files did in Windows 3.1. However, Windows still uses .INI files, and many Windows applications still rely on .INI files to deal with program configuration issues.

What are the major .INI files in Windows?

The most important .INI files to Windows are WIN.INI (which sets up the software and environmental aspects of Windows), and SYSTEM.INI (which sets up the hardware configuration aspects of Windows). All Windows programs have .INI files: Program Manager has PROGMAN.INI, Control Panel has CONTROL.INI, Netscape has NETSCAPE.INI, and so on. These files are located in your /WINDOWS subdirectory.

When are .INI files created or modified?

.INI files are created when you install a Windows-based program (like Microsoft Office, or Netscape), or when you install Windows itself. Some install programs (like a sound card driver install program) will modify existing .INI files, like WIN.INI or SYSTEM.INI, so that your PC will recognize the device (or software) and use it appropriately.

What happens when my .INI file gets erased or corrupted?

If you accidentally erase your .INI file (or files), the Windows-based program you want to run will NOT operate. Usually, it won't even load at all. In this particular case, use an undelete program to recover your deleted .INI file(s). If your .INI file gets corrupted, error messages may appear on the screen upon program loading, and certain features of your program may not operate properly.

How do I fix a corrupted .INI file?

You can edit an .INI file with an ASCII text file editor, like the DOS EDIT program, or with Windows Write or Notepad. HOWEVER, most .INI files are full of terse, somewhat unintelligible instructions. Unless you have copies of an un-corrupt .INI file, or unless you know how to correctly edit your .INI file, it's probably best not to mess around with them too much. The best way to fix a corrupted .INI file is to delete it, then re-run the software installation program. The install program will create a new .INI file, and re-install the program components of your software package, usually WITHOUT wiping out your existing data files. (However, you may want to back up your data files, just in case.)

How do I prevent .INI file disasters?

Go into your \WINDOWS subdirectory, and copy all of your .INI files to some other directory on your hard disk. For example: make an \INIFILES subdirectory on your hard disk (use the MD command to make the \INIFILES subdirectory), then copy all of your .INI files from the \WINDOWS subdirectory into the \INIFILES subdirectory. Thus, you will have a spare, good copy of your .INI files, so that if your original gets corrupted, you can restore your program to normal by replacing the corrupted .INI file with your good spare copy in your \INIFILES subdirectory.

Also, you can write-protect your .INI files with the ATTRIB command in DOS. That way, your .INI files will never be over-written, changed or corrupted. At the DOS prompt, in the \WINDOWS subdirectory, type ATTRIB +R *.INI and press Enter. This write-protecs only your .INI files. Use the -R flag turn write protection off, if necessary.

USING THE CONTROL PANEL IN WINDOWS
You can change the operating environment of Windows (and Windows 95 / 98) through the **Control Panel**. It allows you to modify the following things:

- the type of monitor you use
- the type of printer you use
- the system date and time
- the type of mouse you use
- the type of network you use
- the colors and fonts used on your screen
- the sounds played for specific system events
- the multimedia settings for your sound card
- the drivers used to operate specific devices
- the type of keyboard you use

In Windows 95 / 98, the Control Panel gives you additional features:

- you can add/delete new hardware
- you can change your modem
- you can set the resources used by Plug&Play devices
- you can set network preferences
- you can add/delete programs
- you can modify your e-mail/fax preferences
- you can change your display preferences
- you can detect hardware/software misconfigurations
- you can add networking protocols like TCP/IP

The most valuable part of the Control Panel in Windows 95 / 98 for a technician is the **System** icon, which takes you to the **Device Manager** utility. The Device Manager allows you to see the resource usage of every component plugged into your computer, and allows you to delete the component, or to change the device's resources (like IRQ levels and port addresses). Understanding how the Device Manager works will enable you to solve a host of configuration-related problems. Also, the installation and trouble-shooting "wizards" in Windows 95 / 98 will help you to correctly install and configure devices on your PC.

**General Rules**

You should tread gently when using the Control Panel. Have a clear idea of what you wish to do before manipulating any of the system settings in the Control Panel. Changing the fonts or colors in Control Panel shouldn’t create any major problems; changing the monitor settings to something incorrect could cause Windows to malfunction. Use the following guidelines to help you use the Control Panel correctly:

- Know the exact kind of hardware changes you wish to make,
- have the exact make and model of your device available,
- make sure to have any driver software disks ready for installation, and
- practice using the Control Panel by changing less-vital settings (date/time, mouse sensitivity, etc.) BEFORE trying to make other more critical settings.

**Learning How to Use the Control Panel in Windows 3.1**

Use the Windows Help utility to guide you through the use of the Control Panel. To practice using the Control Panel, do the following things (use Windows 3.1 rather than Windows 95):

- Make a copy of your WIN.INI and SYSTEM.INI files and place them in a protected directory; copy these files when the system is working properly.
- Then, practice using the Control Panel. Make whatever changes you wish.
- If you corrupt the system settings and Windows locks up, replace the WIN.INI and SYSTEM.INI files with the protected copies. This will return Windows to normal.

Refer to the Windows 3.1 or Windows 95 / 98 documentation for further information on using the Control Panel.
INSTALLING VIDEO CARD DRIVERS IN WINDOWS

When you buy a video card, it normally comes with a video driver disk. This disk contains video driver software that allows your video card to display higher levels of resolution with more colors than are available with the standard Microsoft-provided video drivers. To get these higher levels of resolution and additional colors, you need to run the install program found on this disk. If you don't have the install disk, contact the video card manufacturer or the dealer to obtain the disk.

Running the Install Program

To install the video card driver, put the first disk into the A:\ drive, then click on File - Run, then type in the name of the install program on the A:\ drive (usually SETUP or INSTALL) and press Enter. In Windows 95, click on Start, then Run, then give the name of the install program and press Enter. Follow the directions on the screen to correctly install the program. Usually, these types of programs will automatically make the changes in the Control Panel for you, thus saving you a few steps in the install process. In fact, in Windows 95 / 98, the AutoRun feature will automatically start the New Hardware Install Wizard program from a CD-ROM disk.

Setting the Resolution, Number of Colors, and Refresh Rate

Once the driver has been installed, some utility program will probably also be installed that lets you modify the resolution (640 X 480 to 1280 X 1024), the number of colors (64 to millions of colors), and the refresh rate of the monitor (the frequency at which the monitor operates; usually 60, 72 or 75 Hz). Run the utility program, and then select the resolution, numbers of colors, and refresh rate you desire for your system. HINT: unless you have a "multisync" monitor, select 60 Hz as your standard refresh rate; check the documentation on your monitor to determine your monitor type. Normally, this is all you need to do to improve the video performance on your monitor.

But now my screen is all messed up ...

If you try to make your video card (or monitor) display at a rate greater than is possible, your screen may turn into a jumble, or Windows may just go blank and lock up.

If this happens in Windows 3.1, reboot the computer and get to the DOS prompt; then, from the C:\WINDOWS prompt, type SETUP and press Enter. Then, when the setup program is running, tell Windows to use the STANDARD VGA video driver. Then, go back into Windows, and re-run the video setup utility program, this time selecting the correct video resolution.

In Windows 95 / 98, re-boot the computer, then press F8 when the PC begins booting up; select "safe mode" from the menu on the screen, and re-run the video setup utility program, this time selecting the correct video resolution. You can also make changes from the Control Panel Display icon.

NOTE: Some video driver install programs that work in Windows 95 do NOT work in Windows 98. Be sure that your set of drivers will work with the operating system version you are choosing. If you are not sure, contact the manufacturer or your parts vendor.

There will be question on the A+ examination on how to modify display properties in Windows using the Display icon in Windows 95 / 98. There will also be questions on how to install the vendor-supplied video drivers in Windows.
CONFIGURING PRINTERS IN WINDOWS

Before you use a printer in Windows (or Windows 95 / 98), you must first install a printer driver so that Windows (and your Windows-based programs) will know what kind of printer you have, and what types of capabilities your printer does (or does not) have. You will do this through the Windows Control Panel, or you will use the installation disk provided by your printer manufacturer.

Installing from Control Panel

From the Windows 3.1 Program Manager screen, go into the Main window, and then double-click on Control Panel. When the Control Panel comes up, double click on the Printers icon. A screen will appear that tells you what printers you currently have installed. Click on the ADD button, and then click on the name of the printer you wish to install. If the name does not appear on the list, select "Unlisted printer". When prompted, you may need to insert a Windows installation disk, or a disk supplied with your printer, into the A:\ drive to load the necessary Windows printer driver. When you re-boot, Windows will be able to use your new printer.

In Windows 95 / 98, click on Start, then Settings, then on Control Panel. Double click on the "Add Printer" icon. The Add Printer Wizard will walk you through the process of installing a new printer. Be sure to select the exact brand and model of printer you wish to install (i.e., HP DeskJet 550C). Be sure to have your Windows 95 / 98 CD available if the install wizard requires a driver from the disk, or be sure to put the "cabinet files" (installer files for Windows 95/98) onto your hard disk. If your printer is not listed, put the install disk provided by the printer manufacturer into the floppy (or CD-ROM) drive, and click on the "Have disk" button. Windows 95 / 98 will then load the manufacturer-supplied driver. When asked, choose to print a test page to ensure that the printer is installed correctly.

Installing from An Install Disk

Some printers have a set of disks you need to install for your printer to operate properly. To install the printer driver, put the first disk into the A:\ drive, then click on File - Run, then type in the name of the install program on the A:\ drive (usually SETUP or INSTALL) and press Enter. In Windows 95, click on Start, then Settings, Control Panel, Add/Remove Programs, then Install, then give the name of the install program and press Enter. Follow the directions on the screen to correctly install the program. Usually, these types of programs will automatically make the changes in the Control Panel for you, thus saving you a few steps in the install process.

But my printer doesn't work ...

Unfortunately, many printer manufacturers make LOUSY installation software and inept drivers that don't work. If your printer does not work after installing the new driver software, make sure that all of the connections are correct from your PC to the printer, make sure the printer is turned on, and that it is on-line.

If all this is true, and the printer still doesn't work, try to use another printer driver for a similar, LOWER-NUMBERED printer model from the same company. For example, if you have a Canon BJC-210 printer, and the drivers from the company won't work, use the Microsoft-provided drivers for another Canon printer, like the BJC-200. OR, use an EPSON printer driver: most ink-jet and dot matrix printers have an Epson printer emulation that will get you going. For laser printers, pick an HP Laserjet II printer driver: most laser printers will emulate an HP Laserjet II or above. THEN, call the manufacturer and obtain the newest drivers from their bulletin board or web site.

Picking the Right LPT or COM Port

When installing the printer driver, make sure you tell the program to which hardware port the printer will be attached. This can be LPT1: through LPT3; or COM1: through COM4:. Make sure you select the correct port, and specify the correct IRQ and port address, if necessary. Sending your print job to the wrong port will ensure your print jobs never show up.
STAGES IN THE LASER PRINTING PROCESS

There are several distinct stages involved in creating a printed page with a laser printer. Listed below is a description of each of the six stages:

1) Conditioning Phase

In this phase, a uniform negative electrical charge is applied to the drum unit within the laser printer (or within the toner cartridge). At the same time, a uniform negative charge is also applied to the paper as it passes by the corona wire (or corona transfer roller) within the printer. This will permit the image to be electrostatically transmitted from the drum to the page during the transfer stage, when positively-charged toner will be attracted to the page.

2) Writing (or Exposing) Phase

In this phase, the laser diode within the printer writes (or exposes) an image to the drum; this image is what will be written out to the paper, once the toner is applied to the drum and then transferred to the paper.

3) Developing Phase

In this phase, the portion of the drum that was written to by the laser is exposed to toner. The toner is attracted to the image written on the drum by the laser, and the toner image is created. The toner dust has a negative charge, and will be attracted to the positive charges formed by the letters on the drum. As such, the toner dust will "change charges" and accept a positive charge at the end of this process.

4) Transfer Phase

In this phase, the image on the drum (which is just toner dust arranged into a pattern) is electrostatically transferred from the drum to the paper. Specifically, the positively-charged toner is attracted to the negatively-charged paper, and the image is laid out upon the paper. The charge on the paper has a greater potential than the charge on the drum, and so the image is transferred to the paper.

5) Fusing Phase

In this phase, the paper (with the toner applied to it) is quickly heated by the fuser assembly, and the toner image is pressed into and melted onto the paper. In this way, the image is permanently preserved on the page.

6) Cleaning Phase

In this phase, the drum unit is cleaned of any excess toner, and the negative charge on the drum is neutralized. Also, on the heat roller in the fuser assembly, a cleaning bar cleans and lubricates the heat roller to ensure that heat will be applied evenly on the next page.

Some versions of the A+ practice exams (specifically, the Wave Technologies exam) place the cleaning phase at the beginning of the six-step process, instead of at the end ... in any event, the six stages themselves are all the same.

There are a number of questions on the A+ exam that deal with the laser printing stages (also referred to as the "electrostatic printing process" or EP process); you will need to know what the stages are, and what happens in each stage of the process.
STAGES IN THE LASER PRINTING PROCESS - CONTINUED

Here are some typical problems you might encounter with a faulty laser printer:

- **Conditioning Problems**: No image is written to the page, since the electrical charges were not applied correctly.
- **Writing Problems**: Image is poorly laid out, spotty, has gaps in it, or the image is absent. If laser is “solid on”, then whole page will be black.
- **Developing Problems**: Poor image, weak image, spots on page or excess toner problems.
- **Transfer Problems**: No image is written to page; clumps of toner spot the page.
- **Fusing Problems**: Image wipes off the page.
- **Cleaning Problems**: Residual images are printed on page; excess toner builds up inside printer.

Always refer to the laser printer’s technical or user guides for guidance on printer error codes and repair procedures ... not all laser printers are made alike.

**Remember: when servicing a laser printer, use the following rules:**

- Clean out excess toner
- Check for and remove paper dust and paper shreds
- Make sure paper pick-up rollers are clean, and that they have no flat spots; replace if necessary
- Use denatured alcohol, not rubbing alcohol, to clean pickup rollers
- Use compressed air to blow dust away from optical and mechanical sensors
- Vacuum or clean ozone filter of dust and particulate matter
- Check toner cartridge; replace if necessary
- Check darkness/contrast adjustment; make any necessary corrections
- Print a test page for the customer to show proper operation
- If the Windows printer driver for that make of printer does not work correctly, use an HP LaserJet driver; virtually all laser printers have an HP LaserJet emulation mode that should work
- If you are having printer driver problems, contact the manufacturer of that printer for information on how to get a correct or updated driver for Windows (either 3.x, Win95, or WinNT ... one driver does NOT fit all shades of Windows!). These drivers are usually available off the Internet, from the company's web site.
- Use the **Add Printer icon in the Printers folder in Windows 95 / 98 to add or configure a new printer**. The Add Printer Wizard will walk you through the installation process, and it will allow you to print a test page as well. The Wizard will also help you to troubleshoot any printer installation problems.

The A+ examination deals extensively with printer installation issues in Windows 3.x and Windows 95 / 98, and also with printer troubleshooting problems.

**NOTES**
PRINTER MAINTENANCE INSTRUCTIONS

Laser Printers

1) Make sure that the toner is being delivered evenly, without a lot of excess getting around the inside of the printer. Adjust the toner flow regulator (a dial inside the printer) to increase or decrease the flow of toner. If the toner cartridge is nearly empty, replace it. If the cartridge is leaking toner, replace it.

2) Vacuum out the ozone filter and fan assembly, and generally clean/vacuum the inside of the printer. Excess toner throughout the printer causes crummy copies.

3) Do NOT expose the transfer drum to direct light; the more light it's exposed to, the more poorly it will perform.

4) Check for stray bits of paper. Small shreds of paper will cause paper jams if not removed. Also, recommend that users buy decent quality paper; cheaper recycled paper leaves paper dust which causes paper jams and affects the performance of optical sensors within the printer.

5) Make the printer print a test page; show the customer that the printer is working correctly.

6) Make sure the software you use is specifying the correct printer driver; using the wrong printer driver will cause poor/slow printing, or no printing at all.

Ink-jet and Dot-matrix Printers

1) Check the print head, especially if the print quality is poor. If the head has a lot of ink buildup on it, clean the head with denatured alcohol and a soft toothbrush. Make sure the pins in the dot matrix print head move freely. Make sure the jet nozzles on the ink-jet printer are clean.

2) Check the ribbon in the dot-matrix printer; if the ribbon appears worn in spots, or if the print quality is light or imperfect, replace the ribbon. Re-inking the ribbon should be a last alternative. Also, check the gap adjustment on the print head to make sure that it is making good contact with the ribbon and paper.

3) Check the ink cartridge in the ink-jet printer. If the print quality is poor and the print head appears clean, replace the cartridge. Note that some ink cartridges can be re-filled, but also know that some inks are of poor quality. The printing will never be better than the quality of ink you put in the printer.

4) Check for stray bits of paper. Small shreds of paper will cause paper jams if not removed. Also, recommend that users buy decent quality paper; cheaper recycled paper leaves paper dust which causes paper jams and affects the performance of optical or mechanical sensors within the printer.

5) Make the printer print a test page; show the customer that the printer is working correctly.

6) Make sure the software you use is specifying the correct printer driver; using the wrong printer driver will cause poor/slow printing, or no printing at all.

Other Important Tips

Make sure you have the manuals for the printer when servicing it; printers may have complex paper paths inside them, or special programming interfaces that require attention to fix the problem.

Make sure the driver software has been installed correctly on the PC, and that the correct printer model has been selected; corrupted drivers will cause a printer to malfunction or not print at all. If necessary, contact the printer manufacturer for updated or replacement driver disks.

Check the print rollers; if they have flat spots or don't pick up the paper correctly, replace them.

Check any sensors within the printer; a malfunctioning sensor (optical or mechanical) can shut down the printer completely. Clean optical sensors with denatured alcohol, and blow dust away from any kind of sensor.

Call the printer manufacturer for technical assistance when necessary. There are several questions on the A+ examination that deal with the maintenance and troubleshooting of dot-matrix, ink-jet and laser printers.
INSTALLING WINDOWS APPLICATIONS

Installing Windows application software is usually quite simple. Here's how it's done:

- Put the install disk in the CD-ROM drive, or put the first floppy disk of the install disks into the A: drive.
- For Windows 3.1 users, click on File, then Run, then type in the name of the install program (usually A:\SETUP or A:\INSTALL), and click OK. The install program should continue from that point, and it will prompt you as to what to do next.
- For Windows 95 / 98 users, click on Start, then Settings, then Control Panel, then select the "Add/Remove Programs" icon, then click on the install button. Indicate the name of the install program if necessary (usually A:\SETUP or A:\INSTALL), and click OK. The install program (or Wizard) should continue from that point, and it will prompt you as to what to do next. Installing from here enables program uninstallation if necessary.

If you have an install program on a CD-ROM, simply put the disk into the CD-ROM drive: the setup program should automatically execute in Windows 95 / 98, and load your new application package.

What does the install program do, anyhow?

When an install program runs, it does the following:

- It creates a new directory on your hard disk,
- loads the program files into that directory on your hard disk,
- creates a new Windows group and/or program icon, and
- it modifies your WIN.INI & SYSTEM.INI files (and Registry in Win 95/98) so that the program will run properly.

What should I do to prevent a disaster?

Occasionally, install programs corrupt your .INI files or make drastic changes to your CONFIG.SYS and AUTOEXEC.BAT files, or will corrupt the Windows Registry. To prevent disasters like this, make spare copies of your WIN.INI, SYSTEM.INI, CONFIG.SYS and AUTOEXEC.BAT files BEFORE installing a Windows (or DOS) program. That way, the damage can be undone by replacing the messed-up files with the known good files. Keeping a copy of your Registry files in Windows 95 / 98 (specifically SYSTEM.DAT and USER.DAT) is a good idea, too.

Other important tips

Be sure to check for viruses on your PC AND your install disks BEFORE you install the program, and only install from known clean (virus-free) original disks or backups that you made of the disks.

Some programs require that you temporarily disable your virus protection software before install the new software. If this is the case, follow the instructions for disabling the software provided by your vendor. Usually, in Windows 95/98, right-clicking on the virus program icon in your "system tray" (the bottom right corner of Windows 95/98), and then selecting "disable" will temporarily disable the program, so you can install your software.

In some cases, you may want to run SCANDISK (and/or MEMMAKER) to fix system problems that might prevent the installer from working correctly. For example, if you have insufficient conventional memory, some install programs will terminate; running MEMMAKER in a DOS environment should fix the problem. If you are running Windows 95/98, use the sample CONFIG.SYS and AUTOEXEC.BAT files to optimize your conventional memory. In the same way, running SCANDISK may fix disk-based problems that prevent the installer from running correctly.

If you have problems with the install disks (i.e., the installer won't run, disk 3 won't read, an error message appears on the screen, etc.), contact the software manufacturer for technical assistance. Whenever possible, install software from CD-ROM disks. The disk media is much more reliable, and you need to feed only 1 disk into the computer. Further, CD-ROM drives transfer data much more rapidly than floppy drives.

INSTALLING NETSCAPE ON A PC
Installing Netscape is generally quite easy. However, there are three separate pieces of software that make it possible for you to “surf the ‘Net”, all of which can cause installation problems. Here's what each of the parts are, and what they do:

**The Dialer Program**

The dialer program will initialize your modem, dial a number to your Internet Service Provider (ISP), and connect you to your access provider. It will then call up your TCP/IP protocol stack (which enables data transfer between you, your ISP, and the Internet). Then, Netscape (or your compatible browser) will load, which will get you onto the World-Wide-Web.

**The TCP/IP Program**

This program lets your PC talk to your ISP, and to the Internet. You may have a SLIP (Serial Link to Internet Protocol) connection, or a PPP (Point-to-Point Protocol) connection, both of which do essentially the same thing. There will usually be a file installed on your PC called WINSOCK.DLL, which is the TCP/IP protocol stack (or instructions) into Windows. Your dialer will load WINSOCK.DLL into memory when needed.

**Netscape (or your compatible browser)**

Netscape is a browser that lets you use hypertext links to jump from place to place on the World Wide Web. Netscape has its own program directory, it's own .INI file, and generally has an e-mail and newsreader program built into it. It gets loaded last in the process of getting on the Web.

**Preventing Install Problems**

To prevent install problems when loading Netscape, use the following rules:

- Make sure that your modem is working, that it is using the correct IRQ and port address settings, that it is not conflicting with any other installed device, and that no other device uses the same IRQ as your modem (even if the other device has a different port address).
- Make sure you have sufficient conventional memory (at 560k out of 640k) to run Netscape, and that you have at least 8MB of RAM on your PC (4MB generally isn't sufficient).
- Make sure that your video card is using at least a 256-color driver, so that .GIF and .JPG images will display correctly on your PC.
- Make sure you have at least 40MB of space on your hard disk; newer browsers use TONS of disk space to load the helper applications (like RealAudio, Adobe Acrobat, etc.).

**How Do I Install All 3 Programs?**

- Put the install disk in the CD-ROM drive, or put the first floppy disk of the install disks into the A: drive.
- For Windows 3.1 users, click on File, then Run, then type in the name of the install program (usually A:\SETUP or A:\INSTALL), and click OK. The install program should continue from that point, and it will prompt you as to what to do next.
- For Windows 95 users, click on START, then Settings, Control Panel, Add/Remove Programs, Install, then type in the name of the install program (usually A:\SETUP or A:\INSTALL), and click OK. The install program should continue from that point, and it will prompt you as to what to do next. If you have an install program on a CD-ROM, simply put the disk into the CD-ROM drive: the setup program will automatically execute.

If you have problems with the install disks (i.e., the installer won't run, disk 3 won't read, an error message appears on the screen, etc.), contact the ISP for technical assistance.

There will be a number of questions on the A+ exam on how to install applications in Windows 3.x and Windows 95 / 98.
TIPS TO REMEMBER WHEN RE-INSTALLING WINDOWS

Sometimes, Windows just gets screwed up. Install programs go crazy, users mess up settings, files get corrupted or deleted, and so forth. When this happens, it's usually time to re-install Windows. HOWEVER, don't just wipe everything off your disk ... try these steps first:

Check your hardware

Before doing anything, run a full hardware diagnostic on the PC: make sure that ALL of your components (video, memory, CPU, etc.) are working correctly. Faulty memory or a bad video card will crash Windows as effectively as anything else. Run a complete virus check with a reputable anti-virus program before taking this first step. Also, back up your personal files onto floppy disks BEFORE doing any restoration work.

On the first rescue attempt, save your .DLL, .INI and .GRP files

.DLL files are Dynamic Link Libraries, which contain much of the program code that makes a Windows application work. .INI are initialization files that tell Windows programs how to run, and where to find the needed .DLL files. .GRP files are group files, that tell Windows where the program icons are to be located.

On your first rescue attempt, save all of your .GRP and .INI files in your /WINDOWS subdirectory, and all of the .DLL files in your /WINDOWS/SYSTEM subdirectory into some temporary directory on your hard disk. THEN, re-install Windows over the existing files. Re-copy the .GRP, .INI and .DLL files back to their original locations after the re-install procedure. 60 percent of the time, this will fix the problem.

What if that doesn't fix the problem?

Save your .GRP, .DLL and .INI files as before to some temporary directory. THEN, delete off the entire /WINDOWS directory, subdirectories and all. Use the DELTREE command to do this in one step. Then, re-install Windows, and then restore your .INI, .DLL and .GRP files. This should fix the problems you are having in Windows.

What if that STILL doesn't fix the problem?

Then, you delete off EVERYTHING that's Windows-related, including the .DLL, .GRP and .INI files. Perform a full installation of Windows, and fully re-install all of your Windows applications.

Moral of the story

Remember to back up your PC when it is working correctly, so that you can rescue yourself when things go terribly wrong.

We will discuss re-installing Windows 95 / 98 and restoring the Windows Registry a little later in the class.

NOTES
UNDERSTANDING THE REGISTRY IN WINDOWS 95 / 98

Windows 95 Registry Overview

The Windows 95 Registry provides a single, unified database for storing system and application configuration data in a hierarchical form. Because the Registry contains all the settings required to configure memory, hardware peripherals, and Windows 95-supplied network components, you may find that it is no longer necessary to configure settings in startup configuration files (CONFIG.SYS & AUTOEXEC.BAT) and initialization (.INI) files. Because settings are stored in a central location, you can provide both local and remote support for system configuration using Windows 95 tools.

The Registry is similar to the INI files used under Windows 3.x, with each key in the Registry similar to a bracketed heading in an INI file and with Registry values similar to entries under the INI headings. However, Registry keys can contain subkeys, while INI files do not support nested headings. Registry values can also consist of binary data, rather than the simple strings used in INI files.

Although Microsoft discourages using INI files in favor of Registry entries, some applications (particularly 16-bit Windows-based applications) still use INI files. Windows 95 supports INI files solely for compatibility with those applications and related tools (such as setup programs). The AUTOEXEC.BAT and CONFIG.SYS files also still exist for compatibility with real-mode system components and to allow users to change certain default system settings such as the PATH environment variable. New Win32-based applications can store their initialization information in the Registry.

The Registry provides the following benefits in Windows 95:

A single source provides data for enumerating and configuring the hardware, applications, device drivers, and operating system control parameters. The configuration information can be recovered easily in the event of system failure. Users and administrators can configure computer options by using standard Control Panel tools and other administrative tools, reducing the likelihood of syntactic errors in configuration information.

A set of network-independent functions can be used to set and query configuration information, allowing system administrators to examine configuration data on remote networked computers. The operating system automatically backs up the last good configuration used to start the computer.

Because user-specific Registry information can be maintained on a central network server when user profiles are enabled, users can have access to personal desktop and network access preferences when logging on to any computer, and settings for multiple users can be maintained on a single computer. Also, system policies can be used to enforce certain Registry settings for individuals, workgroups, or all users.

Registry .DAT Files

There are two main Windows Registry files: SYSTEM.DAT and USER.DAT. These files contain the configuration settings for both the core Windows program, and settings for any specific users of that computer system. The backups for these files are called SYSTEM.DA0 and USER.DA0. The primary and the backup files are set by ATTRIB to be System, Hidden and Read-Only files.

Main Registry Components

There are several classes of registries within the single Windows 95 / 98 Registry. Each class deals with a specific aspect of how Windows associates files with applications, and configuration settings with users and hardware. Listed below are the major classes within the Windows Registry:

HKEY_CLASSES_ROOT, HKEY_CURRENT_USER, HKEY_LOCAL_MACHINE, HKEY_USERS, HKEY_CURRENT_CONFIG, and HKEY_DYN_DATA.
UNDERSTANDING THE REGISTRY IN WINDOWS 95 / 98 (CONTINUED)

What do these parts of the Registry stand for?

**HKEY_CLASSES_ROOT**

This part of the Registry provides Windows with the information it needs to associate different types of files with the applications for which they belong. For example, .DLL files are called and used by application software, or can be downloaded from the Internet; .AVI files are video files that the Windows Media Player (MPLAYER.EXE) will display for you. If you double click on the icon for an .AVI file, MPLAYER would load automatically and play the file, because the Registry associates that file with that application.

**HKEY_CURRENT_USER**

This part of the Registry provides Windows with the "personal" desktop configuration information needed for the currently logged-in user of Windows. Windows gives you the ability to have multiple configurations of the same installation of Windows for different users of the same machine, so each person's desktop will be configured to their liking. This includes desktop schemes, sounds, colors, icons, keyboard layout, networking configuration, and available software.

**HKEY_LOCAL_MACHINE**

This part of the Registry provides Windows with the non-user-specific, hardware based aspects of the host (or current) computer. For example, the HARDWARE branch of this subtree is where Windows stores all of the information about Plug-and-Play based hardware in your computer. Your network hardware configuration, hardware requirements of application software, audio and video controls, drive controller and video card configuration, and your PCI bus configuration information is all included in this part of the Registry.

**HKEY_USERS**

This part of the Registry provides Windows with the list and configuration information for all registered users of Windows on that PC. In this instance, registered means anyone who has logged into the PC (NOT the network) and has done anything under the desktop interface. The same kinds of information found in HKEY_CURRENT_USER will be found for all recognized users under the HKEY_USERS subtree.

**HKEY_CURRENT_CONFIG**

This part of the Registry provides Windows with the current machine's hardware and Plug-and-Play configuration. This is set (or reconfigured) through the use of .INF (information) files used when Windows installs new devices into the PC. The Windows configuration manager is primarily responsible for controlling this aspect of the Registry, working together with the Plug-and-Play BIOS, the device drivers and VxDs (virtual device drivers), the software enumerators that poll each Plug-and-Play device, any resource arbitrators on the system board, and the application programming interfaces (APIs) that allow software to interface with the hardware.

**HKEY_DYN_DATA**

This part of the Registry provides Windows with the information it needs to use dynamic (virtual) device drivers, or VxDs. Dynamic drivers are loaded only when an application calls to a specific resource on your PC (modem, sound card. etc.); these drivers may not necessarily be loaded when Windows boots up. The VXDLDR module of Windows handles the loading of VxDs when needed by the operating system and/or the specific device. Also, this part of the Registry keeps track of information on the kernel of Windows that has been loaded into RAM, the Virtual FAT that has been loaded into RAM, and the Virtual Memory Manager module of Windows.
UNDERSTANDING THE REGISTRY IN WINDOWS 95 / 98 (CONTINUED)

Restoring the Registry Files

From time to time, the Registry files can be corrupted, either by a virus or by an errant install program. When this happens, Windows will fail to load properly, and will probably give you an error message stating that the Registry files are corrupt.

However, there is a procedure that will restore your Registry files to normal by over-writing the corrupted files with their good backups. Here is how to do it:

1) Start or restart your computer. As the computer is starting, and as you see the message "Starting Windows 95 ...", press the F8 key. When the menu appears on the screen, select the option for "Command Prompt only".
2) At the command prompt, change to the \Windows subdirectory by typing "CD\WINDOWS" and pressing Enter.
3) At the C:\WINDOWS prompt, type in the following commands, and press Enter after each command:
   
   attrib -h -r -s system.dat
   attrib -h -r -s system.da0
   attrib -h -r -s user.dat
   attrib -h -r -s user.da0

4) Create backups of the current Registry files by using the following comands, pressing Enter after each command:
   
   copy system.dat system.bak
   copy user.dat user.bak

5) Then type the following commands, pressing Enter after each command:
   
   copy system.da0 system.dat
   copy user.da0 user.dat

6) Restart your computer ... Windows 95 should restart normally.

If this procedure does not correct a corrupted Registry file problem, you will likely need to dump Windows and reload it completely from your install disk. You may want to use the procedures listed on page 19 of this guide to try and rescue Windows before dumping and reloading it.

TIP: Make copies of your SYSTEM.DAT and USER.DAT files today onto a floppy disk, if your computer is working correctly. Follow steps 1 - 3 as above, then type the following at the command prompt, pressing Enter after each command:

   copy system.dat a:\
   copy user.dat a:\

   This will make a duplicate copy of your Registry files, which you will save away for a rainy Windows day.

Using Regedit to Edit Your Registry

Windows 95 / 98 comes with a Registry editing tool that can help you to repair or edit a faulty registry. The program is called REGEDIT.EXE. It is a fairly simple database editor, and it lets you search the Registry for specific text strings (by pressing Ctrl - F). If Windows gives you error messages that certain VxD files could not be found on your PC, you can use REGEDIT to go into the Registry and delete out all mentions of that now-missing VxD file, thereby eliminating the error messages at system boot-up time.
UNDERSTANDING THE REGISTRY IN WINDOWS 95 / 98 (CONTINUED)

BE CAREFUL, HOWEVER, WHEN RUNNING REGEDIT ... even the experts at Microsoft recommend that you not use Regedit unless you know exactly what you are doing. Usually, it's better to reinstall the missing software, or uninstall the errant software, rather than messing around with the Registry. When you uninstall a software application, the uninstaller edits the Registry for you, removing all mentions of any VxDs or drivers that will no longer be needed. It's much better to let the software developer's uninstaller change the Registry, rather than you, especially since they know what Registry entries were made in the first place. Please use this guide when editing a Registry, and don't add or delete anything unless you are absolutely sure that it's the right thing to do.

For the A+ examination, you will need to know what the Registry is in Windows 95 / 98, what are the major classes (or subtrees) within the Registry, how to edit the Registry (use Regedit), and how to restore your backup registry in the case of emergency.

Also, you can use the Emergency Recovery Utility that comes with Windows 95. ERU saves the WIN.INI, SYSTEM.INI, PROTOCOL.INI, SYSTEM.DAT, USER.DAT, CONFIG.SYS, AUTOEXEC.BAT, IO.SYS, MSDOS.SYS and COMMAND.COM files in compressed format, along with a DOS-based utility that restores these files to their normal location. This utility is available on our web site, if you would like to obtain it.

NOTES
CONFIGURING PLUG-AND-PLAY DEVICES IN WINDOWS 95 / 98

In Windows 95 / 98, Plug-and-Play functionality has been built into the operating system. This means if you insert a Plug-and-Play device into an ISA, VESA Local Bus or PCI bus connection, Windows will attempt to identify the device when the system boots the next time, and will attempt to load a driver for that device automatically. Also, the device can be built so that the device’s resource needs (IRQ level, port address, DMA channel needs, memory address range) can be set by software, rather than by setting physical jumpers. This relieves the technician from having to figure out which jumpers or switches need to be set to make the device run correctly ... the install script on the manufacturer's install disk should handle all of this for you (in theory).

The .INF File and the Install Process

When Windows installs a new Plug-and-Play device, it looks for an .INF file on either a floppy disk or CD-ROM disk. This .INF file was created by the hardware manufacturer to help Windows (and you) to correctly install your new device, and ensure that it does not conflict with any other devices in your computer. In fact, software programs on CD-ROM disks use a file called AUTORUN.INF to tell Windows to automatically run the install program once the CD disk is inserted into the drive.

The .INF file will run a script for the Windows Hardware Install Wizard that states how the new device should be configured, what drivers should be loaded, and where the install files for those drivers can be found on the install disk(s). If for some reason Windows cannot find the .INF file on your disk, you should manually search the disk until you find the correct file. If you still can't find the file, contact the vendor or manufacturer for further assistance. You may also find that if Windows recognizes the device, the Cabinet files on the Windows install CD may contain the drivers that you need to properly install the device.

The Windows 95 / 98 Device Manager

The Device Manager in Windows 95 / 98 will let you see whether or not your installed devices are set up and working properly, and also you can change the resource properties for any given device on your PC. By simply pointing and clicking, you can reconfigure your Plug-and-Play devices if the install script did a poor job of configuring your device.

To access the Device Manager, double-click on the System icon in the Control Panel. Then, select the Device Manager tab in the System Properties box.

To view the resource settings of any device in your computer, double-click on a device type, and then click once on any displayed items within the device type, then click on the "Properties" box. By selecting the "Resources" tab that appears for that device, you can see what the resource usage is for that device. Double-clicking on the "Interrupt Request", "Memory Range", or "Input/Output Range" fields will let you select another value for that device, provided that the "Use Automatic Settings" box is un-checked, and that your device manufacturer has specified in the .INF file that alternate ranges and values can be selected.

Looking for Devices in All the Wrong Places ...

Many times when you install Windows 95 / 98, it will incorrectly install a device that it identifies during the evaluation phase of the Windows setup program. For example, your sound card may be installed as an "Other device" in the Device Manager, when it should be installed as a "Sound, video and game controller". When this occurs, your sound card will not work until it appears in the Device Manager under the "Sound, video and game controllers" category.

To fix this problem, you can delete the reference to the device in the Device Manager, and allow the .INF file on the device's install disks to correctly install the unit. Simply click on the the incorrectly installed device in the Device Manager to select it , and then click the "Remove" button. Say "Yes" when asked to confirm removal of the device. Then, run the install program for the device, or simply re-boot the computer, and let Windows attempt to correctly identify and install the device using the existing drivers.
CONFIGURING PLUG-AND-PLAY DEVICES IN WINDOWS 95 / 98 (CONTINUED)

Using Windows 95 Drivers in Windows 98

Many Windows 98 users are now reporting that when they install the sound card, modem or video card drivers on their computers, Windows 98 goes haywire. That is because many of the core .DLL files and VxD driver files that came with Windows 98 don't work with Windows 95-class drivers. Windows 98 DLLs have the same names as their Windows 95 counterparts, but are not necessarily compatible with 95-based drivers or install scripts. Make sure that if you are running Windows 98 that you have drivers that are designed to work in a Windows 98 environment. You will need to check with your hardware vendor or manufacturer to make sure that everything is in order.

If you have upgraded to Windows 98 and your sound card (for example) suddenly quits working, it is probably because of a .DLL or VxD conflict arising from your upgrade of Windows. You can use use a program that came with Windows 98 called the Version Conflict Manager (VCM.EXE) to replace a Windows 98-class .DLL file with the Windows 95-class version of the same file. Windows 98 can (and does) work with the 95-class .DLL files, but with some minor loss of performance. VCM.EXE is installed on your PC when Windows 98 is installed ... click on Start, then Run, then enter VCM.EXE and click OK. The Version Conflict Manager will attempt to correct the problem on your PC, and allow your devices to run as expected.

If VCM does not solve the problem, use the procedure listed on the previous page to delete the affected item from the Device Manager, then attempt to re-install the device using Windows 98-compliant drivers. If this does not work, contact your vendor or part manufacturer for assistance.

As always, with any software upgrade, read the reviews from the major PC information sources (PC Magazine, InfoWorld, PC Week, etc.) BEFORE jumping into a system upgrade. Learn from the experience of others before becoming a victim of new technology.

There will be a number of questions on the A+exam that deal with installing devices in a Windows 95 / 98 environment, using the Install Wizards in Windows 95 / 98, and how to configure Plug and Play devices in the Windows Control Panel.

NOTES
WHAT IS RESEARCH TECHNOLOGY ASSOCIATES, INC.?

Research Technology Associates, Inc. is a non-profit corporation, as stated in Section 501(c)3 of the IRS Code.

The goals of the Research Technology Associates, Inc. are simple:

- Locate and obtain surplus computer equipment in our community;
- Test and refurbish this equipment;
- Distribute this computer equipment to schools and various non-profit organizations in our community; and
- Provide quality training at an affordable cost to schools, charitable organizations, and the non-profit community.

Services provided by Research Technology Associates, Inc. include:

- Picking up unwanted and surplus PC equipment from individuals and corporations;
- Refurbishing computer equipment at our facilities;
- Placing this equipment in non-profit organizations throughout the world;
- Providing training and support to various organizations, and
- Teaching individuals computer repair techniques through the ENT 184 (PC Hardware) and ENT 284 (PC Repair) courses offered at PG Community College, and at other colleges nationwide.

Engineering students at Prince George's Community College and other local community colleges provide much of the labor, resources and volunteer time needed to test and repair this equipment. Our volunteer base comes from a broad cross-section of people from throughout our community. Our Board of Directors is comprised of business leaders and computer technicians from all over the Washington DC area.

Research Technology Associates, Inc., gives individuals and corporations a way to give back to the community:

- The training opportunities offered through PG Community College provide students valuable job skills for today's computer-oriented business market;
- Computers end up in deserving schools and non-profit corporations, not in landfills; and
- Individuals and corporations receive tax deductions for donating their surplus equipment.

Volunteers are needed to transport computers from donor organizations to our offices in Upper Marlboro MD, and to our repair facility at Prince George's Community College in Largo MD. We also need volunteers who can test, repair and prepare computers for distribution to various charitable organizations.

For further information about Research Technology Associates, Inc., or if you would like to volunteer your services, please contact Bill Lloyd, Corporation Vice-President, on 301/372-2889.
GUIDELINES FOR OBTAINING EQUIPMENT FROM RESEARCH TECHNOLOGY ASSOCIATES

If you want to obtain computer equipment from Research Technology Associates, Inc., you will need to do the following things ...  

1) Send your request to: 

Research Technology Associates, Inc.  
12221 Van Brady Road  
Upper Marlboro, MD 20772-7924  
FAX: 301/372-0086  
E-mail: wlloyd@nheri.org  
Our phone number is 301/372-2889.

2) Provide us with your non-profit organization's name, address and phone number;

3) Provide us with a record of your non-profit or charitable organization status, such as: 
   o a 501(c)3 form which your organization filed with the IRS, or 
   o a photocopy of your state tax exempt number.

4) Indicate as precisely as you can what you would like to receive. We routinely receive the following kinds of PCs:
   o 80286, 80386 and 80486-class PCs with floppy and hard drives 
   o Monochrome, CGA, EGA and VGA color monitors 
   o Macintosh, Mac Plus, and Mac SE computers 
   o Dot matrix printers and/or laser printers 
   Requests for more advanced equipment than this may take some time to fill. Also, requests for multiple PCs may be delivered on a flow basis. 

   Let us know if you need more than one PC, or if you just need a certain component (i.e., a monitor, a hard drive, a video card, etc.)

5) Have patience. Our waiting list is growing, just as our corporation is growing. Depending upon the request, you may have to wait several weeks to receive your PC. We are a volunteer organization; we receive no tax subsidies, and our volunteers and board members receive no compensation. We will fill your order for a PC as soon as possible.

6) Make arrangements to pick up the PC when it's ready. Once your PC is ready, you will make arrangements to pick it up. We can ship the PC to your location, but you will need to pay for the shipping. It's usually cheaper to come to our office and pick it up. Contact us at our main office for details.

7) Write a check to Research Technology Associates, Inc. We provide computers to non-profit organizations at greatly reduced prices. The price we charge for a computer defrays our costs in obtaining, refurbishing and delivering the PC to you. We receive no Federal, state or local funding for our program; therefore, we use the income generated from the sale of computers to sustain our work. A current price list is available from Research Technology Associates upon request; please call our main office for details.

8) Let us know of organizations that are disposing of surplus PC equipment. We are always looking for organizations that are disposing of their surplus computer equipment. Companies and individuals that donate equipment to our organization receive a letter which can be used for tax deduction purposes with the IRS. The more PCs we receive, the faster we can get you the equipment you need.

If you have further questions, please call us at 301/372-2889. We look forward to serving you.
GUIDELINES FOR DONATING EQUIPMENT TO RESEARCH TECHNOLOGY ASSOCIATES

If you want to donate computer equipment to Research Technology Associates, Inc., you will need to do the following things...

1) Contact our organization at:

Research Technology Associates, Inc.  
12221 Van Brady Road 
Upper Marlboro, MD 20772-7924 
E-mail: wlloyd@nheri.org 
Our phone number is 301/372-2889.

2) Indicate as precisely as you can what you have to donate. We routinely accept for donation the following kinds of equipment:

- 80386 and above AT-class PCs with floppy and hard drives
- Monochrome, CGA, EGA and VGA color monitors
- Keyboards and mice
- Macintosh, Mac Plus, Mac SE, MAC LC series and Power Mac computers
- Dot matrix printers and/or laser printers
- Scanners and/or other miscellaneous computer/office automation equipment
- Software

The more we know about the equipment you have AND the condition of the equipment, the better we can service people who are currently on our waiting list.

3) Make arrangements with Research Technology Associates, Inc. to deliver the PCs to us, OR arrange for us to pick up the PCs from your location. If you can deliver your PC to us, that would be most helpful. We have three locations throughout the DC area where you can deliver your surplus equipment.

We CAN come to your site and pick up your equipment, also. You will need to contact us for details on picking up the equipment from your site. Volunteers with our organization will come to your site to pick up the equipment.

4) Let us know if you would like a tax-deductible receipt for your records. Research Technology Associates, Inc. is a non-profit corporation, as specified in Section 501(c)3 of the IRS Tax Code. Persons or organizations contributing equipment to Research Technology Associates will, upon request, receive a letter acknowledging the donation which can be used for tax deduction purposes.

Please let us know to whom the letter should be sent, including the person's or organization's name, address and ZIP code.

5) Let us know of any other organizations that are disposing of surplus PC equipment. We are always looking for organizations that are disposing of their surplus computer equipment. The more PCs we receive, the better we can serve the various non-profit organizations that look to us for assistance.

If you or your organization will have additional equipment to donate in the future, please let us know. We can make arrangements to pick up the equipment at that time.

6) Consider volunteering with Research Technology Associates, Inc. We are always in need of persons who can do the following things:

- Test, repair and evaluate computer equipment
- Pick up and deliver computer equipment (trucks and/or station wagons are needed, too)
- Answer telephones and prepare correspondence for the mail

We encourage you or your organization's employees to contribute a few hours a week to the work of Research Technology Associates, Inc. Contact our office for details.

If you have further questions, please call us at 301/372-2889. We look forward to serving you.