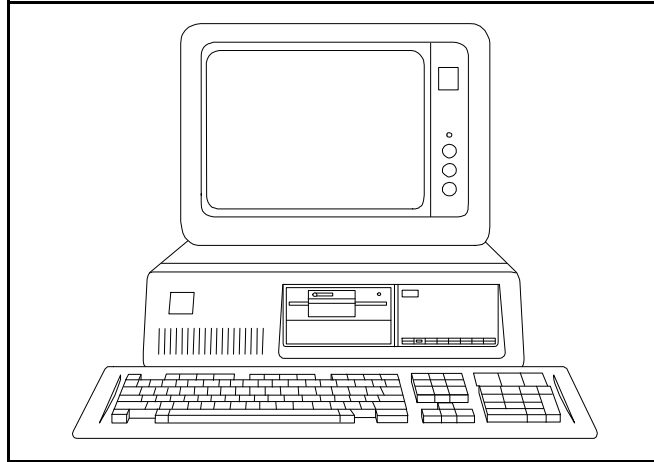


ADVANCED PC CONFIGURATION AND REPAIR
RESEARCH TECHNOLOGY ASSOCIATES, INC.



This course will enable you to do the following things:

Trouble-shoot BIOS setup programs, trouble-shoot operating system installation problems, trouble-shoot video problems, trouble-shoot hard disk problems, trouble-shoot RAM-related problems, trouble-shoot application software-related problems, trouble-shoot user-imposed problems, and trouble-shoot registry problems using the Win95 registry editor.

Copyright, William A. Lloyd, 1999.

**Reproduction of these materials is prohibited
without the express written consent of the author.**

TABLE OF CONTENTS

<u>Topic</u>	<u>Page Number</u>
Foreword	iii
Course Syllabus	1
Places to get a toolkit	3
Class Reading Assignment	4
Trouble-shooting BIOS setup programs	5
Trouble-shooting operating system installation problems	8
Trouble-shooting video problems	14
Trouble-shooting hard disk problems	17
Trouble-shooting RAM-related problems	21
Trouble-shooting application software-related problems	23
Trouble-shooting user-imposed problems	26
Trouble-shoot registry problems using the Win95 registry editor	31
What is Research Technology Associates, Inc.	35
Guidelines for obtaining equipment from Research Technology Associates, Inc.	36
Guidelines for donating equipment from Research Technology Associates, Inc.	37

FOREWORD

These course materials were originally developed for use in the PC Hardware, PC Repair, Repair and Maintenance of Personal Computers, and the Build-Your-Own PC courses which I taught at Prince George's Community College, in Largo, Maryland. I developed these materials myself, with a view towards making complex issues in PC hardware and maintenance easy to understand. Through several years of teaching these courses and refining these materials, I believe this manual will be a useful resource for the reader.

I would like to express my deep gratitude and sincere thanks to a number of people who have made the development and implementation of this course possible over the years:

- o My wife, Joyce, and my three children (Christina, Matthew and David), who have shared me with hundreds of students over the years;
- o William Lauffer, the dean of Engineering Technology at Prince George's Community College, who gave me the opportunity to develop and teach these courses;
- o Dirk Faas, Bradley Faas, and Darrell Mattheis, my engineering assistants, who have made me look good so many times and have helped so many students when there wasn't enough of me to go around 20 students at a time; and
- o The board of directors for my non-profit organization, Research Technology Associates, which includes Jess Smith, Francis Ennels, Dirk Faas, Darrell Mattheis, Doug Bishop, and my wife Joyce. They are people to whom I give permission to tell me what to do, and their advice is invariably always excellent.

Reproduction of these course materials without the express written permission of the author is prohibited. If you would like to obtain a copy of these materials, if you would like to have me come and teach my courses for your organization, or if you would like to license this curriculum for use with your school or non-profit organization, please contact me at the following address:

William A. Lloyd
c/o Research Technology Associates
12221 Van Brady Road
Upper Marlboro, MD 20772-7924
301/322-0057
E-mail address: wlloyd@nheri.org

Pricing information for this manual and other information about this course series will be provided upon request.

COURSE SYLLABUS: ADVANCED PC CONFIGURATION AND REPAIR

INSTRUCTOR:

William (Bill) Lloyd

President, Research Technology Associates, Inc.

Telephone: Home - 301/372-2889 (9:00AM - 10:00PM Mon - Sat)

PGCC - 301/322-0057 (Office & Voice Mail)

No calls on Sunday, please.

Please call **ONLY WHEN NECESSARY**; leave a message at home, and I will return your call as soon as possible. You may leave a message on my voice mail by calling my PGCC office phone line. Bring computer problems to class when possible.

OFFICE HOURS:

By Appointment Only; I will work with you and your schedule as much as possible. See me for details. My office at PGCC is in L210B, and my mailbox is in L112A.

TEXTBOOKS

Course Notes: Available at the College Bookstore. Approximate Cost: \$10.00

AND TOOLS:

The BIOS Companion, by Phil Croucher; available from www.electrocution.com.

A computer repair toolkit is **REQUIRED**.

CLASS TIMES:

Classes are held as listed in the Semester Course Listing.

MISSION STATEMENT:

This course will enable you to do the following things:

- 1) Trouble-shoot BIOS setup programs, including the standard and advanced setup options, PNP/PCI setup issues, integrated peripherals, auto detection features, wait states, and custom configurations;
- 2) Trouble-shoot operating system installation problems, including issues with LBA mode and EZDrive software, hard disk and memory problems, and lockups;
- 3) Trouble-shoot video problems, including issues with bad/incorrect video drivers, wrong resolution settings, selecting the wrong monitor type, and getting into safe mode;
- 4) Trouble-shoot hard disk problems, including file corruption in Win95, file naming problems in Win95, bad sectors and Win95's Scandisk, fatal 0E exceptions, and viruses;
- 5) Trouble-shoot RAM-related problems, including unreliable XMS / page fault errors, RAM timing, mixing SIMMs with DIMMs, and fatal OE errors;
- 6) Trouble-shoot application software-related problems, including bad install programs, service packs and patches, conflicting DLL file versions, 16-bit vs. 32-bit DLLs, and user error;
- 7) Trouble-shoot user-imposed problems, such as powering down Win95, deleting directories, not running uninstallers, deleting icons, running multiple operating systems, and viruses; and
- 8) Trouble-shoot registry problems using the Win95 registry editor.

These types of problems will be demonstrated and resolved in class, using overhead display projectors. Different types of PCS, different BIOS chipsets, and different operating systems will be used in the class.

CLASS RULES:

Feel free to ask lots of questions;

Food and drink are permitted in lecture class, but **NOT** in the lab;

Have fun!

COURSE SYLLABUS: ADVANCED PC CONFIGURATION AND REPAIR (CONTINUED)

<u>GRADING POLICY:</u>	Test 1 at 5th week	20 percent
	Test 2 at 10th week	25 percent
	Final Exam	30 percent
	Lab Attendance/Reports/Pop Quizzes	<u>25 percent</u>
		100 percent

Tests will consist of multiple-answer, fill-in-the-blanks, and short-answer questions. Lab participation will be graded by attendance at the labs, taking part in the exercises, completing the PC evaluation forms, and using normal precautions in handling the equipment. Class attendance will be not be graded, but your presence and participation in class is expected and encouraged. Any rescheduling of tests will be granted when you contact me in advance, or if some unforeseen emergency occurs.

CLASS EXPECTATIONS:

This class is the final chapter of a three-part training program that will prepare the student to become expert in the building, configuring and trouble-shooting of IBM-class microcomputers. It is assumed that the student has been through the ENT 184 (PC Hardware) and ENT 284 (PC Repair) courses, and that he/she is familiar with the PC repair and troubleshooting techniques taught in these courses.

Students are strongly encouraged to build a PC during the scope of this class, and to use that PC to learn about the highly technical aspects of PC configuration and troubleshooting. There will be numerous opportunities to test non-working and problematic computers, but the student may need to have their own PC for experimental kinds of troubleshooting and problem resolution. **This may require sabotaging, dumping and reloading an entire hard disk of data. Production or home computers should not be used for such purposes.**

Experimentation with different types of computers and computer problems is strongly encouraged. The degree to which students can both “foul-up” and “fix up” computers as frequently as possible will dictate the richness and value of this class to the student.

Lectures will use class demonstrations and overhead projection units so that students will see how to resolve problems. Lab sections will be supervised by the instructor and several engineering assistants. However, lab sections will be largely self-directed, with the instructor and engineering assistants providing assistance and materials.

If you have any questions concerning this syllabus or the goals of the course, please see me. Welcome to the class.

PLACES TO GET A TOOLKIT

The toolkit you need for these courses should be simple, and cost less than \$20.00 It should include at least the following things:

- Phillips and flat blade screwdrivers (small and medium size)
- A 3-claw part grabber
- A chip inserter and chip extractor
- A TORX head screwdriver
- A 1/4" and 3/16" nut driver
- Perhaps a container to hold small parts and screws

Things you do NOT need include:

- A soldering gun
- Magnetic tools
- Drills

If you have a small voltmeter, that's good; it may be useful in some instances. We have voltmeters in the lab, so you don't have to run out and buy one.

WHERE DO I BUY SUCH A TOOLKIT?

Look in places like:

- Sam's Club
- Egghead Software
- CompUSA
- Radio Shack
- MicroCenter
- Office Depot
- Staples
- PC Shows

Call before you go!! Make sure the store has the kits before you travel out there.

NOTE: I share NO financial stake in any of the above-mentioned companies. I simply give them as sources other students and colleagues have used in the past to find decent toolkits for these courses.

CLASS READING ASSIGNMENTS

You have likely already read the Mueller textbook (Upgrading and Repairing PCs, **10th** Edition) in ENT 184 and 284, so there are no required readings in that book. You should do some review of the text, and have it available as a guidebook for your reference.

For the BIOS Companion book, you will be expected to read the entire text by the 8th week of the class, and then use it as a guide whenever you have random problems with PCs. I will let you know what is crucial to remember from this text during the lecture session for the class.

What if I don't understand something?

Don't worry. Make a note of your questions, and bring them up in class. This is your opportunity to fill in gaps in your understanding of how PCS work. The textbook is written in fairly non-technical English, so it will serve as a good tool for learning.

Will the readings be on the test?

Yes. I will elaborate on this as the course progresses. The main focus of this class is the discussion time you will have with me in lecture, and the lab time you will have with your PC.

See me with any questions.

TROUBLE-SHOOTING BIOS SETUP PROGRAMS

The BIOS setup program on most PCs is intended to allow the user to easily and quickly set up the most important parameters necessary for the POST (Power-On Self Test) to run correctly. Primarily, the user (or technician) will input information such as:

- o Date and time
- o Video type
- o Floppy drive type(s)
- o Boot sequence
- o Hard drive type(s)
- o Peripheral settings
- o Memory size
- o Virus protection

Most of these types of things can be set by an average PC technician without great difficulty. However, there are a number of BIOS Setup issues that are not quite so straight forward. For example, the Advanced CMOS Setup allows you to enable things like built-in virus protection, shadow RAM regions, boot sequences, RAM timing and wait states, and so forth. The Plug-and-Play and PCI Configuration Setup lets you set how PCI bus connections and devices should operate, whether you have installed a Plug-and-Play compatible operating system, and so forth. Each motherboard's settings and options may be different, and depending upon the motherboard "chipset" you have (the set of IRQ, DMA, and keyboard controllers that are permanently mounted onto the system board), different revisions of the same board or BIOS may have different features.

So HOW do you set a motherboard up correctly, or for maximum performance?

Documentation

Before attempting to modify any "non-standard" parameters of a CMOS setup program, you should consult the documentation that came with the system board. If there is no documentation available, at least go to the web site for the BIOS manufacturer and attempt to locate some helpful information about that board, and the revision level of the BIOS chip. Here are the web addresses for the major BIOS manufacturers:

Award: www.award.com **Phoenix:** www.phoenix.com **AMI:** www.ami.com

Microid Research: www.mrbios.com

Yahoo's category for BIOS chips:

http://dir.yahoo.com/Business_and_Economy/Companies/Computers/Software/Operating_Systems/BIOS/

Try to have some paper documentation about the product before making any changes, if that is at all possible.

Recordation

Make a paper record of what the BIOS settings are for each sub-section of the setup program BEFORE you begin tinkering with the settings. At least this way, you will be able to get back to square one if you make any mistakes in working with the setup program. You may be able to print out a copy of each of these sub-sections by using the PrintScreen (or Shift - PrintScreen) button on your keyboard. Try printing out these settings before going to the trouble of writing them down on a piece of paper.

There are also utilities that let you save the CMOS values to a disk file, and then restore those values by booting from a floppy disk and running the restore program for the CMOS values. See your instructor for details on how to obtain such a utility for yourself.

Experimentation

It has been said that experimentation is the basis for all good research. This instance is no different. In order to find the maximum level of performance for your BIOS and chipset, you will have to tweak the settings, reboot the computer, and see what happens. If it works, then bravo ... if it doesn't, then go back and undo that change you just made. The key is: make only one change at a time, in order to make sure that you can analyze correctly the improvement or impairment of the system's performance.

TROUBLE-SHOOTING BIOS SETUP PROGRAMS (CONTINUED)

With some BIOS products, there will be a selection in the Setup program that allows you to choose the "original" settings from the manufacturer, the "optimal" settings, or the "fail-safe" settings from the manufacturer. You may want to try these options in the Setup program, and notice what changes were made in each sub-section of the program, before venturing out on your own.

By the way, **DON'T PUT ANY PASSWORDS INTO THE SETUP PROGRAM UNLESS ABSOLUTELY NECESSARY.** You may be able to clear the password (and all the rest of the CMOS data) by temporarily moving a jumper on the system board or removing the CMOS battery. But if you can't do that, you may be stuck with a system board that has a password that you can't eliminate, ESPECIALLY when you have forgotten the password. The password can prevent BOTH your booting to the operating system AND entering the CMOS Setup program as well. There are better ways of safeguarding your data than with a CMOS password ... see me if you need to know more about this issue.

Education

The Expert's Creed is stated as follows: Ask the one who has the experience. Many local vendors have been doing BIOS troubleshooting and configuring longer than you have, so it pays to consult them for their advice. Your presence here in this class is testimony to this idea. Once you have done the job of CMOS configuration several (or more) times, you will learn (as the experts have) that there are certain features that always should be turned on or off in a CMOS setup program (i.e., setting PCI configuration to Auto, making sure the shadow RAM settings are correct, turning off the Boot sector virus protection before installing your operating system, etc.). The more you do this kind of work, the more you experiment, the better you will get at this process. But start by asking your local parts supplier or computer guru a question like ...

"Is there anything I should know about setting up this system board before I buy it?"

Summary and Lab

The rest of this lecture and lab will be devoted to showing you the various brands of BIOS and CMOS Setup programs ... we will show what each of the various features in these programs are, what the terminology means, and how certain changes are likely to affect your system's performance. You will want to take notes of this session, or record the session if you wish. We will look at the following issues related to CMOS Setup programs ...

Standard and Advanced CMOS Setup Options

The Standard CMOS Setup program in all BIOS products allows you to **manually** input the most critical specifications for your computer, such as the floppy drive types, the hard drive Cylinder/Head/Sector-per-track (CHS) parameters, the date, the time, the memory size, and so forth. Anyone with a minimum of repair training can input this information with little difficulty.

The Advanced CMOS Setup allows you to manipulate other issues that relate to booting correctly and speed optimization. This includes such things as setting the boot sequence (A: then C:, or C: then A:, etc.), enabling specific shadow RAM ranges, enabling boot sector virus protection, enabling a floppy drive seek at boot time, enabling cache memory (both external and internal caches), enabling the quick or full Power-On Self Test (POST), system CPU speed (the turbo switch), enabling RAM parity checking, and various password checking options.

Advanced Chipset Setup Options

The Advanced Chipset Setup options allow you to control the motherboard chipset (DMA and IRQ controllers, keyboard controllers), the way memory is addressed and refreshed, the way memory is tested, the wait states for memory, CPU and bus connections, the way ISA bus connections address devices, and other such features. In order to make changes in this portion of the setup program, documentation for the motherboard or advice from an experienced technician is required before making substantial changes.

TROUBLE-SHOOTING BIOS SETUP PROGRAMS (CONTINUED)

Power Management Options

The Power Management options let you enable or disable the power-saving (or Green) features of the motherboard. Such motherboards can issue commands to specific devices (i.e., the hard disk, the monitor) to power-down (or go to sleep) after a set number of minutes of inactivity. Many of these features are set by device or by IRQ level.

PNP/PCI Setup Issues

The PNP/PCI Setup portion of the program allows you to control the configuration of the PCI bus connections on the motherboard, and the way Plug-and-Play devices are polled and configured. You can also tell the system board that a PNP-capable operating system (like Windows 95 / 98) is installed, the speed and method by which PCI devices are to be addressed, enabling PCI VGA Palette snoop (allowing a multimedia device to check the video card to see what color palette is being used), whether data from PCI devices will move in streams or blocks, how the built-in drive interfaces will pass data along the PCI bus, and also system monitoring features such as fan speed, CPU temperature, and voltages throughout the motherboard.

Integrated Peripherals

This portion of the setup program allows you to enable, disable and/or configure the built-in peripheral devices on your motherboard, such as the floppy drive controller, IDE interfaces, serial/parallel and PS/2 ports, and any other built in devices such as sound cards, video cards, SCSI host adapters, and so forth.

Auto Detection Features

This portion of the setup program allows you to automatically detect the installed hard drives in your system. The CHS parameters from the detected hard drives are passed to the Standard CMOS Setup part of the program, and if logical block addressing (LBA) mode or some other form of sector translation is needed to access the drive as a single partition, those options will be made available to the user at detection time. If the drive cables are not attached correctly, or if the master/slave jumpers are set incorrectly, or if the drive is defective, the drive will not be detected.

Custom configurations

The CMOS Setup program will normally come with an option to load the factory default settings for the entire program, an option to load the values used for the previous boot, perhaps an option for "optimal performance", and also perhaps an option for "fail-safe operation". Beyond that, you are able to tweak any of these settings on your own beyond what the manufacturer provides for you with these canned configurations.

A postscript: There is a book that is worth its weight in GOLD as it relates to BIOS features. It's called **The BIOS Companion**, and it's published by Phil Croucher. His book can be found over the Internet at www.electrocution.com. I strongly recommend your obtaining this book as a permanent desk reference about BIOS and CMOS Setup issues.

NOTES

TROUBLE-SHOOTING OPERATING SYSTEM INSTALLATION PROBLEMS

Normally, the operating system of your choice should install itself on your computer just fine, with a minimum of problems. A specialized script file, called an .INF file, contains the instructions needed for the install program to correctly run on your computer, and it has instructions to follow if it encounters specific issues or problems while installing the operating system. However, there may be specific problems on your computer that the script file cannot overcome, and the install program may bomb (quit abruptly) on you unexpectedly. When that happens, you should explore the following issues before calling Microsoft (or your vendor) for assistance.

System Board Misconfiguration

If your system board has something misconfigured in the CMOS Setup program, your operating system (or other software) install program may bomb on you. Use the instructions contained in this guide on CMOS Setup Configuration for assistance in correcting this type of problem. Many times, using the "Original" default factory settings will solve this type of problem. If it does not, you may want to explore some of these issues listed below.

CPU Speed Over-Clocking

Making a CPU operate at a speed that is faster than rated is easy to do, but it may cause specific kinds of failures on your PC, especially when an operating system install disk is attempting to identify exactly what type of components you have in your PC. You may also cause the CPU to overheat, which will permanently damage the CPU and possibly the motherboard as well. Make sure that any CPU timing jumpers, including voltage jumpers, have been set correctly on your PC before doing any software installations.

CPUs must be set to a specific megahertz speed, a specific clock multiplier, and a specific voltage level ... make sure you have set your system board correctly before proceeding very far with any software (or hardware) installations. Use the documentation from your system board, and also from your CPU manufacturer, to ensure that these settings are correct.

Memory Mismatches, Mis-timing Memory, and Memory Failures

Random Access Memory (RAM) can be very finicky, and so can certain types of motherboards. When adding memory to a system, it is important that you install memory SIMMs (Single In-line Memory Module) or DIMMs (Dual In-line Memory Module) that match each other in type and speed. The SIMMs or DIMMs don't have to have the same memory size, but they must run at the same speed, and they must be the same type (i.e., fast page, EDO, synchronous DRAM, etc.). Also, you should never install both SIMMs and DIMMs on the same system board, UNLESS the manufacturer's documentation explicitly states that it is OK so to do. Usually DIMMs run at 10 - 20 nanoseconds, while the fastest SIMMs run at 55 - 70 nanoseconds. Pushing those SIMMs to keep pace with the much-faster DIMMs will certainly cause memory failures, and may cause the over-heating of the SIMMs as well.

Secondly, the CMOS Setup program may have an option under the Advanced Chipset Features where you can set the memory timing. It is usually best to set this option to AUTO, and let the motherboard automatically determine the speed of the memory units. If you do set this option manually, set the value to exactly what the memory speed is rated. The factory that manufactured the memory will have marked the speed rating on the chips, usually with something like "-6" or "-60" (for 60 nanoseconds). If the system board will not let you set the speed correctly, select a speed that is SLOWER than the chips are rated. Faster SIMMs can go slower, but slower SIMMs can't reliably go faster.

Finally, do NOT assume that since the memory is new, it must be in good working condition. If you encounter memory that you suspect is defective, use a memory tester to check the SIMM or DIMM in question. If such a tester is not available, install the memory into a known-good system board and see whether it works correctly or not. Return any defective memory to your vendor for replacement.

TROUBLE-SHOOTING OPERATING SYSTEM INSTALLATION PROBLEMS (CONTINUED)

Cache Memory Failures

Cache memory is just as likely to fail as traditional SIMMs or DIMMs. Many Level 2 cache (also known as the external cache) memory units are made as proprietary plug-in modules, or are chips that plug into sockets on the motherboard, or may even be soldered into the system board. Level 1 cache (also known as the internal cache) is built into the CPU itself; if that cache is blown (usually from overheating), the CPU must be replaced.

Cache memory failures manifest themselves as an inability to get to an A: or C: prompt, even when it seems that the system is attempting to boot normally. Also, cache memory failures can cause random lockups and illegal operation errors while in Windows 95 / 98.

If you suspect that there may be a cache memory failure in the system board, start by disabling the Level 2 cache in the Advanced CMOS Setup part of the BIOS Setup program. If the cache cannot be disabled in the setup program, simply remove the cache memory from the system board. If this resolves the problem, replace the Level 2 cache, re-enable the cache in the Setup program, then test the system again. If the system still fails with a known good Level 2 (or L2) cache unit, the system board should be replaced, or you can look at some of the other options listed in this section of the curriculum.

Hard Disk Problems

As with memory units, obtaining a new hard disk is not an assurance that the unit is in perfect working condition. The best first way to determine if a drive is working correctly is to perform an auto-detect of the drive from the CMOS Setup program. If the drive is correctly detected, make sure to select the option for logical block addressing (LBA) mode if applicable, and make sure that the specifications match up to the manufacturer's documentation. If the drive is not detected, then the drive is not connected to the drive cable (or power cable) correctly, or the drive's master/slave jumpers are not set correctly, or the drive is not operating at all, or the drive interface may not be functioning correctly.

If the drive is detected but disk problems persist, run SCANDISK on the disk to determine the nature of the problem. If uncorrectable errors exist on the disk in significant numbers (five percent or more of the total disk space), or if the drive continually develops new disk flaws, replace the drive.

If the drive is under warranty, be sure to contact your vendor or drive manufacturer for assistance in replacing the drive. Most hard disks have a 2 - 3 year warranty on them, so be sure to look at the manufacture date to see if you are still in the warranty period.

If the disk still has unusual errors on it, dump everything off the disk, do an FDISK and FORMAT of the disk, and then scan the disk for viruses. Be sure to use clean, non-viral, write-protected disks when installing the operating system or checking for viruses.

CD-ROM Read Failures and Install Disk Failures

Many newer CD-ROM drives have problems with vibration when operating at maximum speed. These problems will cause intermittent read failures ... if such failures happen when you are installing an operating system or application software, the install program may bomb on you. The only way to prevent or recover from such problems is to buy well-known brand-name CD-ROM drives that have a good reputation for consistent operation. Buying cheap CD-ROM drives may end up costing you valuable time and endless frustration when installing your operating system.

Also, if you have problems with the CD-ROM drive not being read correctly, be sure to use the driver software that actually came with the drive. A Toshiba or Mitsumi brand driver may work on a "no-name" drive, but occasionally these drivers will fail to operate your "no-name" drive ... using the manufacturer-supplied drivers should remedy the problem.

TROUBLE-SHOOTING OPERATING SYSTEM INSTALLATION PROBLEMS (CONTINUED)

Further, you may find that your operating system or application software has been duplicated onto cheap, flimsy or defective CD-ROM disks (or floppy disks). Make sure that the data surface of your CD-ROM disks are clean, fingerprint-free, and have as few scratches as possible. If there are imperfections in the disk media, obtain replacement disks from the manufacturer or vendor. A little bit of Pledge furniture polish on the CD may clean up a balky install disk, but be sure to wipe the disk totally clean before using it in the drive.

System Board or Major Component Failures

Your install process may uncover for you some flaw in the system board, or some major component, like a drive interface or video card. When you suspect that this is happening, use a good general-purpose PC diagnostic program to assure yourself that all of the system components are working properly. If something is defective, note this and return the component to your vendor or manufacturer for replacement. Also, notice if something is getting hot on the system board; this is usually a good indicator that something is defective.

Video RAM Failure on a Video Card

Occasionally, your install process may find that the video RAM on the video card is defective. This manifests itself as an inability to display video correctly, or an inability to use the entire color palette, or when Windows will only boot to safe mode, or you get a constant error message that your video card is incorrectly configured. When you suspect that this is happening, use a good general-purpose PC diagnostic program to assure yourself that the video card is working properly. You can also swap in a known-good video card to see if the problem goes away. If something is defective with the video card, note this and return the component to your vendor or manufacturer for replacement.

Windows 95 Incorrectly Installs Components or Features

Many times Windows 95 (and 98) will incorrectly install a component in your system when you first load the operating system. For example, many times you will find that off-brand sound cards will be installed as "Other Devices" instead of "Sound, video and game controllers". When that happens, delete the mentions of the mis-installed device from the "Other Devices" section of the Windows Device Manager, and then run the install disk for that device that came from the hardware manufacturer. This will typically solve the problem, and allow the affected device to operate normally.

Windows 98

Windows 98 can be a real mess if you are not prepared with the right driver software for your computer. 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. The Windows 98 operating system has an entirely new set of Dynamic Link Library (.DLL) files that have the same names as their older Windows 95 counterparts. Even though Windows 98 DLLs have the same names as their Windows 95 counterparts, these files 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 before doing any installation work.

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 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.

TROUBLE-SHOOTING OPERATING SYSTEM INSTALLATION PROBLEMS (CONTINUED)

If VCM does not solve the problem, use the procedure listed above 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.

Viruses

A virus, especially a boot sector virus or a stealth virus, can easily corrupt an operating system or application install program. Be sure that your install disks are clean before beginning the installation; check the disks on a known-clean system with a reputable anti-virus program (F-Prot, McAfee, etc.). If necessary, run an anti-virus program on your hard disk (and a SCANDISK, if possible) before doing an operating system installation. Further, be sure to disable any virus-protecting terminate-and-stay-resident (TSR) programs before doing any kind of software installation ... many software installation programs appear to be viral to the TSR program, and may cause the install program to bomb.

Using Original System Install Disks

Whenever possible, use only the original system disks to install any software program. This ensures that no strange errors crop up when loading your software. If you do use backup diskettes, make sure that they are exactly the same as the original disks. You can use the DISKCOMP utility to compare the disks, or simply use the DISKCOPY program to make your duplicate system disks.

Upgrade Disks vs. Full-Install Disks

There are two different types of software installation disks available from the manufacturer: original full-install disks, and upgrade disks. Full-install disks presuppose that you have no software of any kind on your hard disk, or that you do not have the previous revision of the specific software on your hard disk. Upgrade disks are for those persons who have a previous version of the software on their hard disk already, and who only need to move up to the most current version of the software.

Make sure you know which software package you need to do the installation, since the two packages are NOT interchangeable. You cannot do a full install of Windows 95 / 98 from the upgrade disk, and you cannot upgrade Windows 95 / 98 with a full-install disk.. Once you obtain the correct disk (or set of floppy disks), you will be able to successfully install your operating system or application.

LBA Mode Translations

Logical Block Addressing (LBA) mode allows the user to lie to the BIOS about the architecture (or geometry) of the hard disk, so that the entire disk can be addressed as a single partition. Normally, hard disks with more than 1024 cylinders cannot be addressed as a single unit, and must be partitioned and addressed with special software, such as what comes with OnTrack's Disk Manager product. LBA mode lets the user (and computer) reduce the number of cylinders reported in the CMOS Setup, while increasing the number of read/write heads by the same proportion in the setup program. By doing this, you can have drives that are larger than 512 megabytes (the maximum of what could be addressed without LBA mode) addressed as single partitions on your PC.

In order for this feature to work correctly, you must enable LBA mode in the CMOS Setup program BEFORE performing an FDISK and FORMAT on the hard disk. If you don't do this, FDISK will partition the disk only to 512MB in size, and you will need to delete the partition table, reboot, and re-FDISK the drive in order to correct the problem.

If you don't have LBA mode as a feature in your BIOS, you should obtain a drive interface card that has a ROM dubbing chip that has LBA mode capabilities built into it (available from Promise Technologies and Future Domain), or obtain an upgraded BIOS chip for the motherboard, or replace the motherboard with one that has LBA mode in the BIOS.

Using EZ-Drive and Other Such Programs

For those motherboards that do not have LBA mode as a feature, there is a program called EZ-Drive that can potentially provide a solution. EZ-Drive provides at a software level the same LBA translation capabilities that are found in the ROM BIOS firmware. It will allow non-LBA motherboards to access and use hard drives larger than 512 MB as a single partition. Many hard drive manufacturers provide a copy of EZ-Drive when you purchase a new drive. You will typically use this software when adding a large drive on an older '486-class system. Virtually all Pentium system boards have LBA mode built into the BIOS, and as such EZ-Drive should NOT be used on a Pentium system.

HOWEVER, EZ-Drive will not work with Windows NT, and may give you significant problems when running Windows 95 / 98, especially when attempting to install the operating system. Also, if you have LBA mode built into your motherboard's ROM BIOS and you install EZ-Drive on your hard drive, you may find that EZ-Drive will conflict with the motherboard's firmware and cause hard disk addressing failures.

As a general rule, NEVER use EZ-Drive to install a hard disk on a computer UNLESS you know that the motherboard does not support LBA mode, and you have no other options for upgrading the system. Also, be sure to read the EZ-Drive documentation carefully BEFORE installing the drive and/or your operating system on that drive. Further, the ONLY way of getting rid of the EZ-Drive software on the hard disk (short of a low-level format) is to use the EZ-Drive disk to UNINSTALL the software. Therefore, if you get a copy of the EZ-Drive install disk, be sure to keep it, since you may need it to uninstall the software at a future date on some poor soul's PC.

Service Packs from Microsoft

Instead of issuing revised versions of Windows 95 (or other programs), Microsoft made available to the customer via their web site programs called **service packs**, which when run will update Windows 95 / 98 with revised versions of specific files that have had reported problems. These service packs are available from Microsoft at no charge for Windows 95, Windows NT, and for the Microsoft Office 95 and 97 suites. These files are self-extracting archive files that will automatically unpack and then install the proper components on your PC. There is a service pack for the original version of Windows 95 that will bring you up to the "A release" of the software; there are no service packs for the "OSR2" or "B release" of Windows 95; there are several service packs for Windows NT, and there are several service packs for Microsoft Office 95 and 97 suites. If you encounter unusual problems on your PC, it is possible that running a service pack upgrade may fix the problem. Contact the Microsoft web site at www.microsoft.com for more details.

Cabinet Files and Windows 95 / 98

There are specialized install files located on the Windows 95 and 98 installation CD called "cabinet files". These files have the extension .CAB, and all of the installation files and hardware/software drivers are in compressed form in these files. In Windows 95, these files are located in the \WIN95 subdirectory; in Windows 98, these files are located in the \WIN98 subdirectory. These files should be copied to the user's hard disk after the Windows 95 installation is completed, and should be placed in a \WIN95 or \WIN98 directory. By doing this, the user never needs to insert the Windows 95 installation CD when adding or changing hardware or software components on their PC.

In the case of Windows 98, you may find that on some newer system boards, your CD-ROM drive may cease operating midway through the install process. To prevent an operating system install failure, copy the cabinet files from the installation CD to the hard disk BEFORE beginning the installation setup program from the CD-ROM disk. That way, if the CD-ROM drive quits operating during the installation, you can point to the C:\WIN98 subdirectory on your hard disk, complete the installation of Windows 98, and then correct the problem with the non-operating CD-ROM drive (usually by installing the IDE bus mastering driver from the motherboard manufacturer). If you encounter such a problem, contact your hardware vendor or hardware manufacturer for details. In fact, copying the cabinet files to the hard disk before any Windows installation is probably a very good idea.

TROUBLE-SHOOTING OPERATING SYSTEM INSTALLATION PROBLEMS (CONTINUED)

Summary and Lab

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. Practice on a non-production system before doing the real thing on a production PC.

The rest of this lecture and lab will be devoted to simulating different kinds of operating system install problems, showing the proper solution to each problem. You will want to take notes of this session, or record the session if you wish.

NOTES

TROUBLE-SHOOTING VIDEO PROBLEMS

Many times you will find that the user has mis-configured the way that the video card is delivering a signal to the monitor. When that happens, the display may be distorted, unreadable, or the system may just go dark on you. This segment of the course will explore how to deal with problems related to video card failures and misconfigurations.

Video Hardware Failures

Occasionally the video card itself will fail. You will know this is the case if you hear an audio error code from the PC indicating a video adapter failure. Such an audio error code will should like 1 long and 2 short beeps, 1 long and 3 short beeps, or 1 long and 8 short beeps. When this occurs, you may want to try the following things before replacing the video card:

- o Re-mount the video card in the bus connection, and see if this corrects the problem. Occasionally board creep will cause the card to malfunction, and re-mounting usually solves the problem. You may also want to try inserting the board into another socket to see if that resolves the problem.
- o If the video RAM is socketed on the video card, make sure that the RAM is inserted correctly into the sockets or connectors on the board. If you suspect that the socketed RAM is defective, remove the RAM, re-install the board, and see if the problem resolves itself. If the RAM is defective, contact your vendor or manufacturer for replacement RAM.
- o If the video card is HOT, that may be an indication that a component on the board is defective. If this is the case, replace the board immediately.

If the video card does prove to be defective, replace the card with another of similar type. If possible, try to install an exact replacement card, so that you will not need to reconfigure any video drivers in Windows 95 / 98. If you do install a different brand or model of card, be sure to install the vendor-supplied video drivers, so that the user will get the maximum performance level from the video card.

Issues With Bad/Incorrect Video Drivers

In order for the user to get the optimum performance from their video card, you must ensure that the correct video driver is installed in Windows 95 / 98. These drivers are usually installed from a CD-ROM disk that was supplied by the video card manufacturer, but many video card manufacturers have put their drivers onto the Windows 95 / 98 installation CD. If you select the wrong driver for the brand and model of video card you have, you may get no video at all, or distorted video at best. Also, it is possible that the manufacturer provided you with a buggy, non-working set of drivers ... when that happens, you will need to contact the manufacturer to obtain the most up-to-date set of drivers (usually from their Internet web site or FTP site).

Also, 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 to obtain the correct software.

Running the Video Driver 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, Settings, Control Panel, then Add/Remove Programs, 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.

You can also install drivers by using the Add New Hardware icon in the Control Panel, selecting Display Adapters as the type of device to install, and then selecting "Have Disk" on the dialog box that appears on the screen. So long as Windows 95 / 98 can find the .INF file needed to process the installation, you can install the drivers in this manner.

TROUBLE-SHOOTING VIDEO PROBLEMS (CONTINUED)

Incorrect Video Resolution Settings

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. SVGA monitors will operate at 60, 72, 75 and 83 Hz refresh rates; older models may only do 60 and/or 72 Hz. Normally, this is all you need to do to improve the video performance on your monitor.

You should also know that the number of colors displayed by your monitor is not a function of the monitor, but the video card itself. The amount of installed video RAM along with the software drivers will determine how many colors can be displayed. Old VGA monitors can display 32 million colors, but can't display them at higher levels of resolution. These higher resolution levels usually demand a faster refresh rate on the monitor, which is why Super VGA monitors are superior to older VGA monitors.

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.

Testing Your Video Card With A Good Diagnostic Program

If your video card is displaying an image but is nevertheless defective, you may get a variety of video display problems. Use a good DOS-level diagnostic program like MicroScope 2000 to thoroughly test your video card. MicroScope 2000 has a proprietary operating system that is less troublesome than DOS or Windows 95, and it will allow for a full test of your video card and all of its video RAM. DOS and Windows 95 will only allow diagnostic programs to test the first 256 kilobytes of video RAM. Checkit and QaPlus are good diagnostic programs as well, even though they cannot test the entire amount of video RAM.

Selecting the Wrong Monitor Type

In Windows 95 / 98, not only can you select the type of video card you have, but also the type of monitor. That means that Windows knows what the maximum refresh rate and display properties are for your monitor, and will allow you to get optimum performance from your video sub-system.

HOWEVER, if you tell Windows the wrong information concerning the brand and model of monitor you are using, you may get no video at all. Therefore, it is important to set the brand and model of your monitor correctly in the Display icon of the Windows Control Panel. Windows knows of a wide variety of monitor brands and models, and you can select yours from a list within the Display Control Panel.

If your monitor type is not listed in the Control Panel, then select "Standard VGA 640 x 480" or "Super VGA 800 x 600" in the "Standard Display Types" segment of the Display Control Panel. These monitor type selections will ensure proper operation of your monitor while in Windows.

TROUBLE-SHOOTING VIDEO PROBLEMS (CONTINUED)

Getting Into (and Out Of) Safe Mode

In safe mode, Windows uses default settings (VGA monitor, no network, Microsoft mouse driver, and the minimum device drivers required to start Windows). You will not have access to CD-ROM drives, printers, or other devices. You will use safe mode to access Windows when something is not working correctly, or when you have accidentally set Windows to use the wrong display type or resolution.

When you see the message "Starting Windows 95," press F8. A menu will then appear on the screen, from which you can choose the booting mode you desire. If you want to start Windows without network support, choose Safe Mode. If you want to start Windows with network support, choose Safe Mode With Network Support. You can then make whatever changes you need to in the Windows Control Panel, and reboot the computer for the changes to take effect.

Summary and Lab

The rest of this lecture and lab will be devoted to showing you various kinds of video display problems ... we will show you some computers with various kinds of hardware and software problems, and show you how specific changes are likely to affect your system's performance. You will want to take notes of this session, or record the session if you wish.

NOTES

TROUBLE-SHOOTING HARD DISK PROBLEMS

Hard disks are a common source of computer system failure. Many times, the failure of a hard disk is complete; the motor stops spinning, or the drive electronics fail completely, or the drive is subject to stiction and refuses to spin up consistently. In the case of a solid failure of a hard disk, replacement of the drive is the sole remedy for the problem. Drive data recovery services can recover critical data, but the cost is usually prohibitive for the user. Hopefully, the user has backed up their critical data, and your job as a technician will be that much easier.

This section of the course will discuss what to do when the hard disk failure is not solid or hardware-related. This part of the course will help you to trouble-shoot hard disk problems, including file corruption in Windows 95, file naming problems, problems when SCANDISK will not repair the disk damage, fatal 0E errors, and viruses.

File Corruption in Win95

In Windows 95 / 98, just as in MS-DOS, the operating system has the ability to cache disk reads and writes in extended memory. The net effect of this caching process is to increase the speed and efficiency of disk reads and writes while using Windows. In MS-DOS, the program that provides the disk cache is called SMARTDRV.EXE; in Windows 95, it is called DBLBUFF.SYS. It should be noted that you should NOT use SMARTDRV.EXE in a Windows 95 / 98 environment, as it will actually slow down your hard disk's performance.

However, as with any process where an intermediary is present, the disk caching program may erroneously write garbage data to the disk instead of the correct data. Further, the disk caching program may also accidentally overwrite previously existing data on the disk, causing cross-linked sectors. For the sake of explanation, a cross-linked sector is where two files share the same sector of space on a disk; this situation should never occur, but when it does, both files are corrupted. Unfortunately, this problem occurs more often than anyone would like to admit, and it can cause a great deal of damage to your data files.

The SCANDISK utility in Windows 95 and MS-DOS will not truly fix the problem of cross-linked files on your hard disk. It's concept of fixing the problem means taking the two files, truncating them (cutting them off midway through the file), and cleaning up the data within the cross-linked sector. This may mean that you lose a substantial part of the data in your file. The only resolution you have is to have a good backup of your data file to replace the corrupted one on your hard disk.

As for file that are corrupted by the disk caching programs, there really is no solution other than restoring a good backup from a floppy or network disk. Running a program like Norton's FileFix may resolve some problems, but an archival copy of your data is the best solution.

If you encounter frequent problems with file corruption on your hard disk, running SCANDISK and/or DEFRAG may help. With serious problems, it may be best to dump Windows from your hard disk and reload the operating system from the installation CD.

File Naming Problems in Windows 95/ 98

In MS-DOS, files were named using the 8.3 naming convention. That means that the filename could be 8 characters in length, followed by a period, and then a three character file extension. This kind of file naming convention was extremely limiting and somewhat awkward. However in Windows 95 / 98, you can have filenames of up to 255 characters in length, including spaces. When you leave the Windows environment and go to the DOS prompt, you will find that DOS keeps a second file allocation table, where your long file names have been truncated to conform to the 8.3 filenaming standard. Windows and DOS will generally co-exist peacefully with this arrangement, and generally you will experience no problems with having 2 sets of FATs on your hard disk.

However, if file corruption problems occur upon your hard disk, and if you run the DOS-level SCANDISK program on your hard disk, you may find that your long file names may become a screwed-up mess. The 16-bit, DOS-level SCANDISK program cannot reconcile file name problems with files that have long names. The solution is surprisingly simple: only run SCANDISK from the Windows interface. The 32-bit version of the program will handle DOS-level filenames

Bad Sectors and Win95's Scandisk

The Microsoft utility SCANDISK will allow the user to correct most typical kinds of floppy and hard disk errors, such as lost allocation units, invalid filenames, and bad sectors. However, there are times when SCANDISK will not be able to recover a bad sector on a hard disk. Further, the bad sector can be severe enough that SCANDISK can cause a complete system failure or lockup. If you encounter a situation where SCANDISK causes a system lockup while running the "thorough" scan option, and the computer locks up completely, you should reboot the computer and begin the process of backing up the data on the hard disk (if that is possible). Then, plan to perform a low-level format upon the disk. Normally, a low-level format will identify the bad sector on the disk, mark the sector as bad, and prevent data from being written to that spot on the disk in the future. Some third-party disk repair utilities like Norton Disk Doctor or Microscope 2000 may have the ability to repair or mark a specific sector on a hard disk as bad, and this may correct the problem in the short term, but this author's experience has shown that a low-level format on the disk will both fix the immediate disk corruption problem and find the impending problems lurking upon the hard disk.

Fatal 0E Exceptions

Fatal 0E exception errors occur for a variety of reasons. Programs on the hard disk required by Windows 95 / 98 may have been corrupted. Hardware in the system may have gone defective, and the resulting error may cause Windows to lock up. Also, the hard disk may have specific errors or defects on it that may cause a failure when Windows loads onto your computer. When fatal 0E errors occur, you should do several things before reloading software on your system. First, perform a routine diagnostic on all major computer systems, including RAM, the hard disk, the video card, and the system board. Problems with any of these components can lead to fatal 0E errors. For example, an overheated CPU could be failing, or a hard disk could be having read/write errors, or newly-installed RAM may be incompatible with the existing RAM already installed on the system board.

If the hardware diagnostic shows no problems, then a thorough evaluation of the software on the hard disk is in order. Running SCANDISK, even the DOS-level version of the program, is a must. Further, a thorough virus check should be run to make sure that files have not been damaged. Then, the user should be consulted to see what they were doing just before the series of errors began to occur. It may be that the user did something to corrupt a file, delete some program files, change a configuration in Windows, or install something onto the computer that has caused the problem. Undoing the user's mistake may very well resolve the problem. If these measures do not resolve the problem, then a reload of Windows is in order.

Viruses

There are seemingly no end to the different types of viruses that are present in the world today, and no end to the ways that users will get them onto their computers. Despite anti-virus TSR programs and in-depth virus scanners, some viruses will always find a way of getting through and trashing one's computer. Sadly, most computers are running with no anti-virus precautions at all, and these computers are easy prey to computer viruses and the damage they can cause.

If you are supporting a computer user or a group of users, it is imperative that you install a virus-scanning program on every computer, and you must load an anti-virus terminate-and-stay-resident (TSR) program, that will act as a sentinel to protect from virus attacks, on every computer AND ensure that it loads every time the computer boots. To do anything less is to risk a possible virus infection on a PC or network, which could cause huge amounts of loss to valuable business data if left unchecked.

Good anti-virus software packages include McAfee's Scan product, and Command Software Systems Command Anti-Virus (formerly known as F-Prot). These packages have a known good reputation for protecting against virus infection, detecting infection, and properly removing the infection.

TROUBLE-SHOOTING HARD DISK PROBLEMS (CONTINUED)

You must also train users to be aware of joke programs, trojan horses, and other types of pseudo-viruses that can wreak havoc on a computer's hard disk. For example, remind people during the holiday season that not every "electronic Christmas card" has a holiday greeting in it, but a leftover Halloween trick in it. Many joke programs and trojan horses damaged important business data on computers during the holidays, so teach your users to beware mail messages from unknown "friends".

Below is a quick summary of how viruses affect a computer system; these notes should be familiar from previous ENT courses you have taken.

Viruses will affect your PC in 4 different ways . . .

- 1) **The Boot Sector:** The boot sector is where your operating system files reside on your floppy or hard disk. A virus will go to that location on your disk and corrupt these files (IO.SYS, MSDOS.SYS, and COMMAND.COM) so that your PC will NOT boot up as expected.
EXAMPLE: the STONED virus.

- 2) **The File Allocation Table:** The File Allocation Table (FAT) is a list of all the files on your floppy or hard disk, and where the files are physically located on the disk. A virus will corrupt the FAT so that you cannot locate or access your files.
EXAMPLE: the CASCADE virus.

- 3) **The Partition Table:** The partition table on your HARD DISK tells MS-DOS how big your hard disk is, and what percentage of it is used by MS-DOS. A virus can corrupt your partition table, which wipes out ALL of your files in an instant.
EXAMPLE: the MICHELANGELO virus.

- 4) **.COM and .EXE Files:** Files with these extensions are EXECUTABLE files, which perform a specific action. A virus can attach itself to one of these kinds of files and corrupt the way it operates.
EXAMPLE: the 4096 virus.

There are 3 things a good virus protection program must do:

- 1) **SCAN for viruses:** A good program should be able to check your floppy and hard disks for viruses, as well as the RAM of your computer, and detect the presence of a virus in the 4 locations mentioned above.

- 2) **CLEAN up the virus:** A good program must be able to get rid of the virus it finds in any of the 4 places mentioned above; otherwise, it's useless.

- 3) **PROTECT YOU from viruses:** A good program must have the ability to load a piece of the program into memory at boot-up time, to protect you from getting a virus in the first place. This type of program is called a "Terminate-and-Stay-Resident" (TSR) program.

TROUBLE-SHOOTING HARD DISK PROBLEMS (CONTINUED)

If you find that a virus has corrupted files on a PC past the point of repair, then you should reload the affected software, or if necessary dump the entire hard disk and reload the PC from scratch. As always, a good virus-free backup of the user's hard disk will make this job easier.

This information on viruses is repeated in the section of the notes dealing with user-imposed problems.

Summary and Lab

The rest of this lecture and lab will be devoted to showing you various kinds of hard disk problems ... we will show you some computers with various kinds of hardware and software problems, and show you how specific changes are likely to affect your system's performance. You will want to take notes of this session, or record the session if you wish.

NOTES

TROUBLE-SHOOTING RAM-RELATED PROBLEMS

RAM-related problems are common, and are usually simple to fix. When the technician install known-good, properly-matched, tested memory products, memory errors should be non-existent. If a system rejects the proper type of memory products, and the memory products are known to be operating properly, then the problem more than likely resides with the motherboard, and it should be replaced.

This section of the course will help you to know how to trouble-shoot RAM-related problems, including unreliable XMS memory and page fault errors, RAM timing problems, mixing SIMMs and DIMMs, and fatal 0E errors.

Unreliable XMS / Page Fault Errors

Normally, your RAM will run just fine in your computer. Then one day, your computer displays the message:

HIMEM has detected unreliable XMS memory at address xxxxxxxx.

What this means is that your RAM has failed, and the address given is letting you know at what location in memory the error took place. This may guide you to know which SIMM or DIMM has failed, so that you can replace it and get back to normal operation. But what caused the failure of the SIMM or DIMM? Usually, heat within the system or the heat created by the SIMM (or DIMM) itself has caused the failure. It is also possible that the memory unit was damaged in the process of manufacture and shipping, and the latent damage did not manifest itself until after the unit was put into service. Also, static electricity and/or power surge problems can cause memory failures.

The solution to the problem is simple:replace the defective memory unit with a new, known-good unit. Memory can be tested with specific memory testing machines (which cost a minimum of \$1,000 per unit). You can also test memory by installing it into a known-good system board and then running both the POST test at boot-up and a diagnostic program like Checkit or Microscope 2000. Personally, I use a known-good system board and Checkit to test my memory units, and I have my memory vendors test the SIMM or DIMM before I complete the purchase.

RAM Timing

Memory is timed as to how fast it will reliably operate. This timing information is recorded on the chips found on the SIMM or DIMM. Usually the timing marks will look something like this:

41256 - 60 or 41256 - 6

The marks shown above would be found on 256k chips running at 60 nanoseconds (billionths of a second). A notation of -7 would indicate 70 nanoseconds; a notation of -08 would indicate 8 nanoseconds (usually found on newer SDRAM DIMMs).

When installing memory units into a motherboard, you must install devices of the same speed; installing mismatched memory units will very likely cause problems. A simple inspection of the memory units will prevent you from making such a mistake when installing new memory. If you find that another technician has made a mistake and installed mismatched memory, simply replace some of the memory units in the system until all of them are running at the same speed.

You may also find that you can set the motherboard to operate the SIMMs or DIMMs at a specific speed. This option may be found in AMI and Award BIOS-based systems under the Chipset Options submenu of the setup program. If the user or technician sets the memory speed to an incorrect value in the CMOS Setup program, the motherboard may malfunction for this reason alone. If you are experiencing memory problems on a system with properly-matched, known-good memory units, you may want to check to see if the memory timing value setting in the CMOS Setup program is correct. If the timing setting is incorrect, change the setting to the correct value and reboot the computer. You may also want to contact the motherboard manufacturer or retailer for details on how to optimally configure the memory settings for your motherboard.

TROUBLE-SHOOTING RAM-RELATED PROBLEMS (CONTINUED)

Mixing SIMMs with DIMMs

Many newer motherboards will allow you to install both SIMMs and DIMMs onto the same board. **However, you should never attempt to use a system that has both SIMMs and DIMMs installed at the same time.** The reason is simple: DIMMs run at significantly faster speeds than SIMMs, and the motherboard will attempt to run ALL of the memory units at the higher speed. For example, DIMMs run typically at 12, 10, or 8 nanoseconds, while the fastest SIMMs run at 50 nanoseconds.. To push a 50 nanosecond SIMM to run at the same rate as a 10 nanosecond DIMM will certainly cause program errors. Further, the SIMM will certainly overheat when forced to run at a speed that exceeds its capabilities. Unless the motherboard manufacturer explicitly permits simultaneous SIMM and DIMM installation (usually the reverse is the case), you should never mix SIMMs and DIMMs onto a working motherboard.

Fatal 0E Errors

Fatal 0E exception errors occur for a variety of reasons. Programs on the hard disk required by Windows 95 / 98 may have been corrupted. Hardware in the system may have gone defective, in particular the memory devices, and the resulting error may cause Windows to lock up. Also, the hard disk may have specific errors or defects on it that may cause a failure when Windows loads onto your computer. When fatal 0E errors occur, you should do several things before reloading software on your system. First, perform a routine diagnostic on all major computer systems, including RAM, the hard disk, the video card, and the system board. Problems with any of these components can lead to fatal 0E errors. For example, an overheated CPU could be failing, or a hard disk could be having read/write errors, or newly-installed RAM may be incompatible with the existing RAM already installed on the system board.

If the hardware diagnostic shows no problems, then a thorough evaluation of the software on the hard disk is in order. Running SCANDISK, even the DOS-level version of the program, is a must. Further, a thorough virus check should be run to make sure that files have not been damaged. Then, the user should be consulted to see what they were doing just before the series of errors began to occur. It may be that the user did something to corrupt a file, delete some program files, change a configuration in Windows, or install something onto the computer that has caused the problem. Undoing the user's mistake may very well resolve the problem. If these measures do not resolve the problem, then a reload of Windows is in order.

Summary and Lab

The rest of this lecture and lab will be devoted to showing you various kinds of RAM-related problems ... we will show you some computers with various kinds of hardware and software problems, and show you how specific changes are likely to affect your system's performance. You will want to take notes of this session, or record the session if you wish.

NOTES

TROUBLE SHOOTING APPLICATION SOFTWARE-RELATED PROBLEMS

There are as many problems involved with software usage as there are software programs available on the market today. This particular segment of the course will not attempt to solve every possible software problem you might encounter as a technician ... no technical manual ever could. However, this section of the course will cover how to trouble-shoot application software-related problems of the kinds found in the text below.

Bad Install Programs

Not every software installation program does a perfect job of putting a new application on your PC. In fact, some installers are downright treacherous. A good installation program should do the following things:

- o Create a temporary directory that will be used for the software installation, and then delete the directory from the disk when the installation is completed.
- o Check to make sure that it is not overwriting newer files with older ones, thus potentially corrupting the entire system.
- o Check to make sure that components like the runtime Microsoft Video program aren't installed if they are already present on the system.
- o Check to be sure that you really want to reinstall the software if the program currently exists on the hard disk.
- o Backup the WIN.INI, SYSTEM.INI, CONFIG.SYS, AUTOEXEC.BAT and Registry files to make sure that if something does go wrong, the damage can be undone quickly and easily.
- o Load an uninstaller on the PC for that application (or log an entry with the Windows 95 uninstaller), so that the program can be smoothly removed if necessary.

If an install program doesn't do all these things, then there is a serious possibility that your install program could create a problem on your PC while installing the software. You should read the documentation for the install program before attempting to do the software installation, and try the installer on a non-production PC if you have any serious questions. Also, a good backup of the system may be in order if you aren't sure of the quality of the software or install program.

As a rule, you should always install new software onto a PC from the "Add/Remove Programs" icon in Windows 95 / 98. Installing software this way ensures that you have the ability to uninstall the product if something should go wrong with your PC after your new software is installed. In Windows 95 / 98, 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.

To uninstall the program, simply return to the Add/Remove Programs icon, select the name of the program you wish to uninstall, and click the "Add/Remove" button. The Windows uninstaller will take care of the rest for you, returning the Windows Registry to the state it was in before the software was installed, and removing all related files from your hard disk.

Service Packs and Patches

Instead of issuing revised versions of Windows 95 (or other programs), Microsoft made available to the customer via their web site programs called **service packs**, which when run will update Windows 95 / 98 with revised versions of specific files that have had reported problems. These service packs are available from Microsoft at no charge for Windows 95, Windows NT, and for the Microsoft Office 95 and 97 suites. These files are self-extracting archive files that will automatically unpack and then install the proper components on your PC. There is a service pack for the original version of Windows 95 that will bring you up to the "A release" of the software; there are no service packs for the "OSR2" or "B release" of Windows 95; there are several service packs for Windows NT, and there are several service packs for Microsoft Office 95 and 97 suites. If you encounter unusual problems on your PC, it is possible that running a service pack upgrade may fix the problem. Contact the Microsoft web site at www.microsoft.com for more details. Other manufacturers of software issue "patches" or service packs to upgrade errant software ... if you think you have a real bug in the software, contact your software provider for assistance.

Conflicting DLL File Versions, and 16-bit vs. 32-bit DLLs

.DLL files are Dynamic Link Libraries, that contain much of the program code that makes a Windows application work. Each version of Windows came out with its own set of .DLL files, just like DOS used to be released with version-specific copies of the external DOS commands such as FDISK, FORMAT, and CHKDSK. Windows 3.x-version .DLL files can be a mix of 16-bit and 32-bit executable code, depending upon the file in question. Most all of the Windows 95-version .DLL files are 32-bit operating system files, and virtually all of the Windows 98-version .DLL files are made to work in a 32-bit operating system environment. If you accidentally replace a Windows 95-level .DLL file with one from a Windows 3.x environment, Windows AND the application you just installed will both fail to operate. As a preventative measure, you may want to store somewhere a copy of all of the proper .DLL files for your version of Windows (and applications) in a safe place, just in case something happens to replace one of your .DLL files by accident.

You may also find that within a Windows version, there may have been some updating of .DLL files by Microsoft (or other software vendors) without your knowledge. The general rule is that it is always best to use the most up-to-date version of a .DLL file, unless you know that some kind of software conflict is taking place that would move you to replace a newer file with an older one. Technical support representatives from different companies may instruct you from time to time to replace such files if an application is malfunctioning. Also, service packs and patches will update critical .DLL files, sometimes fixing the problem, and sometimes creating more of a problem. Be sure to contact the software manufacturer for assistance if you encounter such problems.

User Error

User error is probably the most common reason for computer or application software failure. If a person does not know "the rules of the road" concerning how to use a computer or a typical Windows application, more than likely they will do something destructive to the computer without knowing that they did it, or meaning to do so in the first place. Some of the more common mistakes that users will make include:

- o not saving their work regularly
- o not backing up their work on a regular basis
- o saving files to the hard disk instead of a floppy disk, or vice versa
- o forgetting the location of a file, or the name of a file
- o forgetting your password
- o using the same name for two different files, overwriting one with another
- o overwriting good files with bad / blank ones
- o deleting files / icons unintentionally
- o launching more than one instance of a program, because of impatience with the computer
- o printing to a turned-off (or off-line) printer, or to the wrong printer port
- o not knowing how to use the "undo" feature in Windows applications
- o not having an anti-virus program on your computer
- o randomly hitting buttons or keys while the computer is processing some information
- o pressing the reset key while the hard disk is writing data to the disk
- o failing to read the instructions that appear on the screen
- o failing to read the manual
- o having a general paranoia of the computer

As a technician, you have the power to fix (or at least determine) the nature of the user error. Your most important task, however, is to ensure that the user learns from their experience, and does not repeat the same mistake again. You should have at your disposal a number of reference works you can suggest that will enable the user to get up the learning curve concerning the use of a computer product. You should also know of several places where a novice computer user can go to get the training they need to become more skilled in the computing arts. Research Technology Associates is one good source for basic to advanced computer training, and many local community colleges provide excellent computer courses at a reasonable cost. Always recommend to users that they take time for training in computer use and the specific software applications they use regularly. The price of one class can be much less costly than several repeat repair calls on your part, and more satisfying to the user than just fixing repeated problems.

TROUBLE SHOOTING APPLICATION SOFTWARE-RELATED PROBLEMS (CONTINUED)

Summary and Lab

The rest of this lecture and lab will be devoted to showing you various kinds of application software problems ... we will show you some computers with various kinds of hardware and software problems, and show you how specific changes are likely to affect your system's performance. You will want to take notes of this session, or record the session if you wish.

NOTES

TROUBLE-SHOOTING USER-IMPOSED PROBLEMS

Many times you will find that a user will do terrible things to a computer without meaning or intending to do so. User-imposed problems constitute about 35-40 percent of the trouble calls you will encounter on a regular basis. This segment of the class will help you to deal with a variety of user-imposed problems.

Powering Down Windows 95 / 98 Without Shutting Down

There are a number of good reasons why users **MUST** run the "Shut down" feature of Windows 95 / 98 when ending their computing session. The shut down routine cleans up any temporary files created while running Windows applications, ensures that all applications are closed properly before powering down, and it preserves a record of how Windows looks so that it will restore that same image when Windows is run the next time. If the user fails to properly shut down Windows, a variety of problems will arise.

Failing to shut down Windows correctly may cause a growing number of temporary files to accumulate in either the \WINDOWS\TEMP or \TEMP directories. While this doesn't seem like a big issue, Windows will begin to malfunction if more than 50 temporary files exist in these directories. Also, these files can take up valuable disk space, and many software installers will bomb if they detect a large number of "temp files" on the hard disk. As a technician, you should go into these two directories and delete any files with a .TMP file suffix, and also delete any temporary directories you may find as well. Next, you should run SCANDISK to alleviate any problems caused by lost clusters (files with beginning-of-file markers, but no end-of file markers). SCANDISK will turn these lost clusters into files (which should be deleted), or simply delete these lost clusters from the disk straightaway. Further, you also should run the Disk Defragmenter in Windows to reduce any potential disk access problems.

Certain Windows and DOS applications also use temporary files to prevent multiple sessions of a program from running at the same time, and also to note whether the application was properly closed the last time it was used. Also, some programs will modify the WIN.INI, SYSTEM.INI and/or program-specific .INI files each time the program is launched. If you turn off the computer before shutting down Windows, your DOS or Windows-based program may malfunction. One way to alleviate the problem of a Windows application that won't launch properly is to re-install the application **WITHOUT** doing an uninstall beforehand. This will over-write the program files only with new copies of the same files, and will put your application software back to square one, as if it were just installed. Your data files will be unaffected by such a procedure. The same rules will apply for reinstalling DOS-based applications that quit abnormally.

Deleting Directories and Failing to Run Uninstallers

Deleting entire directories in Windows 95 / 98 as a way of eliminating programs is a **MAJOR MISTAKE**. Most applications, during the install process, modify the WIN.INI, SYSTEM.INI and/or Registry files to expect the presence of certain driver programs or .DLL files. If the user deletes these files and/or directories without modifying the aforementioned files, Windows will display a laundry list of error messages on the screen each time the computer boots the operating system. Further, other programs on your computer may now rely on some of these files which were installed for your "third-party product", and now these other applications may fail to operate as well, because you simply deleted off the directory and files without thinking of the consequences.

It is important that you understand (and that the users you support understand) that one must **UNINSTALL** a program in Windows for the operating system to work correctly. In Windows 95 / 98, there is an uninstaller program built into the Control Panel, under the Add/Remove Programs icon. By using the uninstaller in Windows, or by using a third-party uninstall program like Microhelp's Uninstaller, you will assure the following things:

- o Only the necessary files and directories will be removed
- o Files common to multiple programs will be preserved
- o The WIN.INI, SYSTEM.INI and/or Registry files will be modified to prevent any error message displays on your screen
- o Multiple copies of similar files will be removed, and the maximum amount of disk space will be freed
- o You will not develop a headache, or have reason to fuss at the user for doing bad things to their computer.

Deleting Icons

Many people are under the impression that if they delete an icon in Windows, the program goes away. Further, you will find that if they accidentally delete an icon, a user may panic and begin the process of re-installing the affected program all over again. Nothing can be further from the truth. Deleting an icon simply takes an object off of the Windows desktop; the program and all of its related files are still safely stored upon the user's hard disk, including the user's own personal files. One can re-create an icon from within Windows by right-clicking on the desktop, then selecting New, Shortcut, then specifying the name of the executable file in the dialog box. One can also create an icon (or listing) in the Start menu by using the following steps:

1. Click the Start button, and then point to Settings.
2. Click Taskbar, and then click the Start Menu Programs tab.
3. Click Add, and then click Browse.
4. Locate the program you want to add, and then double-click it.
5. Click Next, and then double-click the menu on which you want the program to appear.
6. Type the name that you want to see on the menu, and then click Finish.
If Windows prompts you to choose an icon, click one, and then click Finish.

You can also add a program to the top of the Start menu by dragging the program's icon onto the Start button.

If the icon disappeared because the user ran an uninstaller program, the only way to recreate the icon is to re-install the application software. If the icon is pointing to another computer (or server) on the network, the icon will not work correctly unless the person is correctly logged into the network and has the necessary rights to access the program.

Running Multiple Operating Systems

Some users insist that they need to run multiple operating systems on the same PC, and then will go on to explain to you in great detail the exact reasons for doing such a thing. I have a simple response: **WHY?!?!?** There is no truly compelling reason, in my mind, for running multiple operating systems on the same computer. Yes, you can run Windows NT and Windows 95 / 98 concurrently on the same PC with a minimum of problems, and yes, you can use System Commander to control which operating system you boot to on your PC. But running both operating systems (or multiple operating systems) will require the user to keep straight two (or more) potentially conflicting sets of instructions to do major kinds of tasks, not to mention the problems involved in maintaining two sets of application software as well. The possible problems brought on by using multiple operating systems, and the time you will need to support that one user if he/she gets into trouble, exceeds the amount of time you have available in a day to do such work (including the amount of time you have for sleep as well). Unless there is a mission-critical need for you to maintain two or more operating systems on a single computer, I strongly recommend that you run only one operating system on a PC at a time. If you do venture into running multiple operating systems on a PC, use the following rules to minimize your frustrations:

1. Read any software documentation thoroughly BEFORE jumping into the installation ... have all the facts and procedures in front of you as you begin installing the software.
2. Use well-known, documented operating systems, not beta releases or over-the-net shareware, for your operating systems and control software (such as System Commander).
3. Have the toll-free support phone numbers handy if something goes wrong.
4. **BACK UP YOUR DATA BEFORE DOING AN INSTALLATION OF THIS KIND.** If things really go badly, you may have to dump the whole hard disk, reformat, and reload everything. A little preparedness beforehand will save you lots of grief later.

Printing Problems

In both Windows 3.x and Windows 95 / 98, printing problems are well documented and very common. Printing problems can come from a variety of problems, such as those listed below.

Bad Printer Drivers

The major reason for printer operation failures is that the printer driver is buggy, mis-installed, corrupted, or just plain doesn't work. Further, the print driver may be sending your print job to the wrong LPT port or print queue on the network. Also, users may have installed the Windows 3.x driver, thinking it was the Windows 95-class driver, and now things are in an even bigger mess.

It is imperative that you have a known-good printer driver installed for your specific printer. These drivers should come with the printer when you buy it, or they should be available for download from the manufacturer on their Internet site. If you find that the set of drivers you have is no good, contact the manufacturer for assistance. If the manufacturer's technical support doesn't resolve the problem, return the printer to the place of purchase for an exchange or refund. If that is not an option, use the following guidelines: 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 Series II printer driver: most laser printers will emulate an HP Laserjet II or above. Most ink-jet printers will emulate an HP DeskJet or DeskJet 500 printer.

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.

Picking the Wrong Network Print Queue

When installing the printer driver, make sure you tell the program to which network print queue the printer will be attached. Networked print jobs go from your PC to a print queue, which is a holding area for print jobs. Then, the print queue releases the job to the printer in an organized fashion. If you send your job to the wrong print queue, the print job will never show up at the printer you expect. Consult with your networking staff for assistance in selecting the proper print queue for the desired printer. Also, make sure that you select LPT2: as your printer port; LPT1: is normally your parallel port that is physically connected to your PC, and jobs designated to go to LPT2: will be rerouted through your network card to the network's print server.

Picking the Wrong Printer Type

If you tell Windows that you have an HP LaserJet II printer, and you REALLY have an Epson dot-matrix printer, and you send a document to print, you will get a garbled mess from your printer instead of the print job you expected. If such a problem occurs, make sure that you have selected the right type of printer before you run your print job. This will save yourself much frustration, and lots of wasted paper.

Miscellaneous Problems

In order for a printer to work, it must be turned on, paper must be installed, the ribbon / ink cartridge / toner cartridge must be in good shape, the printer must be on line, the printer cable must be hooked up to the printer AND the back of the PC, the proper printer must be specified in Windows, and the proper document must be opened in your application software. What I have just stated is patently obvious to you the technician ... it is not necessarily so to some users. Be sure that all of the basic issues about printing have been addressed when responding to such trouble calls. I have been paid for nothing more than turning a printer on-line, or making sure the paper was inserted into the printer, or pressing the power cord firmly into place on the printer. Hopefully, I have made my point.

TROUBLE-SHOOTING USER-IMPOSED PROBLEMS (CONTINUED)

Viruses

There are seemingly no end to the different types of viruses that are present in the world today, and no end to the ways that users will get them onto their computers. Despite anti-virus TSR programs and in-depth virus scanners, some viruses will always find a way of getting through and trashing one's computer. Sadly, most computers are running with no anti-virus precautions at all, and these computers are easy prey to computer viruses and the damage they can cause.

If you are supporting a computer user or a group of users, it is imperative that you install a virus-scanning program on every computer, and you must load an anti-virus terminate-and-stay-resident (TSR) program, that will act as a sentinel to protect from virus attacks, on every computer AND ensure that it loads every time the computer boots. To do anything less is to risk a possible virus infection on a PC or network, which could cause huge amounts of loss to valuable business data if left unchecked.

Good anti-virus software packages include McAfee's Scan product, and Command Software Systems Command Anti-Virus (formerly known as F-Prot). These packages have a known good reputation for protecting against virus infection, detecting infection, and properly removing the infection.

You must also train users to be aware of joke programs, trojan horses, and other types of pseudo-viruses that can wreak havoc on a computer's hard disk. For example, remind people during the holiday season that not every "electronic Christmas card" has a holiday greeting in it, but a leftover Halloween trick in it. Many joke programs and trojan horses damaged important business data on computers during the holidays, so teach your users to beware mail messages from unknown "friends".

Below is a quick summary of how viruses affect a computer system; these notes should be familiar from previous ENT courses you have taken.

Viruses will affect your PC in 4 different ways . . .

- 1) **The Boot Sector:** The boot sector is where your operating system files reside on your floppy or hard disk. A virus will go to that location on your disk and corrupt these files (IO.SYS, MSDOS.SYS, and COMMAND.COM) so that your PC will NOT boot up as expected.
EXAMPLE: the STONED virus.

- 2) **The File Allocation Table:** The File Allocation Table (FAT) is a list of all the files on your floppy or hard disk, and where the files are physically located on the disk. A virus will corrupt the FAT so that you cannot locate or access your files.
EXAMPLE: the CASCADE virus.

- 3) **The Partition Table:** The partition table on your HARD DISK tells MS-DOS how big your hard disk is, and what percentage of it is used by MS-DOS. A virus can corrupt your partition table, which wipes out ALL of your files in an instant.
EXAMPLE: the MICHELANGELO virus.

- 4) **.COM and .EXE Files:** Files with these extensions are EXECUTABLE files, which perform a specific action. A virus can attach itself to one of these kinds of files and corrupt the way it operates.
EXAMPLE: the 4096 virus.

TROUBLE-SHOOTING USER-IMPOSED PROBLEMS (CONTINUED)

There are 3 things a good virus protection program must do:

- 1) **SCAN for viruses:** A good program should be able to check your floppy and hard disks for viruses, as well as the RAM of your computer, and detect the presence of a virus in the 4 locations mentioned above.

- 2) **CLEAN up the virus:** A good program must be able to get rid of the virus it finds in any of the 4 places mentioned above; otherwise, it's useless.

- 3) **PROTECT YOU from viruses:** A good program must have the ability to load a piece of the program into memory at boot-up time, to protect you from getting a virus in the first place. This type of program is called a "Terminate-and-Stay-Resident" (TSR) program.

User's Lack of Knowledge in Using Application Software

No amount of tutoring on your part will ever substitute for a user taking the time to learn how to use an application, reading the manual or a good instruction book, using the program on a regular basis, and perhaps even taking a class on the particular application. The rule is simple: the more you work with a program, the better you will be able to use it. The more training you afford yourself, the better you will perform. When you encounter novice computer users (and you will), help them to learn "the rules of the game". In Windows, one application should work the same as another, and use the same kinds of commands to copy, print and edit files. Be patient, and teach them with sound doctrine and careful instruction. Help them to defuse their frustration, while helping them to learn the process of finding the answer, not just calling you for an answer. The proverb goes something like this: if you give a man a fish, he will depend upon you for fish; if you give a man a fishing pole, he will learn to feed himself. So should your instruction be with users.

However, you will encounter people who have NO BUSINESS touching a computer until they have taken a class or two on the subject. When you find such people, be sure to tell them where they can go to find competent instruction. There are many teachers in the world today, and some are better (or worse) than others. Know some places where people can go to find a reliable source of solid computer training. It is the author's hope that Research Technology Associates, the sponsoring non-profit organization for this course, would be such a provider of quality training. However, you should know of several good trainers in your area where people can find help.

Finally, help users to know that if they do stupid things, you cannot be responsible for their loss of data, services or time. If the person knows what is right to do, and then does the wrong things anyway, you cannot be held responsible for the consequences. For example, I recently helped a student to repair a computer for one of her friends. However, the owner of the computer put a password into the CMOS Setup program that prevented us from changing the BIOS settings, or from booting the computer. Further, the owner forgot the password. Finally, the motherboard had a soldered-on type of battery that was not easily removable (to clear the CMOS settings), and there was no password reset jumper on the motherboard. Also, the CMOS chip was designed to prevent shorting-out as a method of resetting the chip. I told the student that the best option for repair was to replace the motherboard. Well, the owner of the motherboard was very upset with me and my student, because we couldn't fix the computer without buying a new motherboard. I had no pity on the owner, and instructed my student to have none as well. If the user couldn't remember the password, then he/she had no business putting one on the computer. Hopefully this makes my point sufficiently well.

Summary and Lab

The rest of this lecture and lab will be devoted to showing you various kinds of user-imposed problems ... we will show you some computers with various kinds of hardware and software problems, and show you how specific changes are likely to affect your system's performance. You will want to take notes of this session, or record the session if you wish.

TROUBLE-SHOOTING REGISTRY PROBLEMS USING THE WIN95 REGISTRY EDITOR

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.

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.

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 commands, 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.

TROUBLE-SHOOTING REGISTRY PROBLEMS USING THE WIN95 REGISTRY EDITOR (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.

Re-Registering Programs Using Windows Explorer and .REG Files

From time to time, you may find that certain programs will begin to malfunction because the Registry entries for that program have become corrupt. The corruption may come from a virus, from another installed program with competing Registry values (i.e., Internet Explorer vs. Netscape), from user error, or from other miscellaneous problems (disk space corruption, installer failure, etc.). When this occurs, there is a process you can use to re-register a program in the Windows Registry without forcing a reload of the operating system. This process should restore a program to normal operation.

To re-register a program in Windows 95 / 98, right-click on Start, then launch Windows Explorer. Select Tools from the menu bar, then select Find, then select Files/Folders, and then search for any files on the hard disk that end in **.REG**. Find the .REG file that correlates to the affected program, and then re-register affected program by double-clicking on the selected .REG file. This should restore the program to normal operation. If it does not, contact the program's technical support staff for assistance.

Summary and Lab

The rest of this lecture and lab will be devoted to showing you various kinds of registry problems ... we will show you some computers with various kinds of hardware and software problems, and show you how specific changes are likely to affect your system's performance. You will want to take notes of this session, or record the session if you wish.

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:

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

Services provided by Research Technology Associates, Inc. include:

- o Picking up unwanted and surplus PC equipment from individuals and corporations;
- o Refurbishing computer equipment at our facilities;
- o Placing this equipment in non-profit organizations throughout the world;
- o Providing training and support to various organizations, and
- o Teaching individuals computer repair techniques through the ENT 184 (PC Hardware), ENT 284 (PC Repair), ENT 286 (Advanced PC Configuration), ENT 188 (Build Your Own PC), and other courses offered at PG Community College (as well as other colleges and schools 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:

- o The training opportunities offered through PG Community College provide students valuable job skills for today's computer-oriented business market;
- o Computers end up in deserving schools and non-profit corporations, not in landfills; and
- o 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 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: wloyd@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 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**

**FAX: 301/372-0086
E-mail: wloyd@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:

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

- o Test, repair and evaluate computer equipment
- o Pick up and deliver computer equipment (trucks and/or station wagons are needed, too)
- o 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.