

## COMPUTER WORKSHOPS

### PRACTICALS

#### STEPS TO BRINGING A NEW PC TO LIFE

1. **Mount the motherboard and apply power first ...** When installing the motherboard to the case, use the proper guidelines for mounting the motherboard to the chassis. Then, attach the power supply connections and the PC speaker ONLY: no RAM, no video card, etc. Power the system up and listen for 3 low-toned beeps. If you hear these beeps, the motherboard is OK (it powers up and finds the CPU). If you hear no beeps, check your power and speaker connections, ensure the CPU is installed OK, and make sure the board is not grounding out. If this does not resolve the problem, replace the motherboard.
2. **Then, install the memory ...** Install the memory to the motherboard; be sure to put it in the right SIMM sockets (look for the designation "BANK 0"). You may need to set some jumpers on the board to get the memory to be recognized properly; also, many boards require more than one SIMM on the board at a time. Once you install the memory, power up the system and listen for a different set of beeps (usually 2 high short beeps and 7 or 8 lower-toned short beeps). These beeps are telling you that the video card cannot be found (mainly because it hasn't been installed yet!). If you get such a beep sequence, you can continue and install the video card. If you still get the three low beeps as before, check and re-install the memory. If the memory is installed correctly and you continue to get only the three low beeps, replace the memory.
3. **Then, install the video card and monitor ...** When you have the motherboard and memory installed correctly, then you can install the video card into the system and attach a monitor. When properly installed, you should be able to see the computer going through POST on the screen. If not, then you may have a problem with the video card (check for 1 long and 3 short beeps) or the monitor. If the system hangs after installing the video card, the video card is probably defective, or not installed correctly. If you see no video on the screen after checking the video card, then either the monitor is off (or without power), or the monitor is defective.
4. **Then, install the drives and drive controllers ...** Once you have motherboard, RAM, and video installed properly, attach the drives to the drive controller/interface. Be sure to get the cable stripes attached next to pin 1 on the interface connectors. Also, be sure to attach power cables to the drives. You may now also install the keyboard.
5. **Then, power up and run the CMOS Setup program on the BIOS ...** When the drives are fully connected,

then run the Setup program. Watch the screen to tell you what keystrokes to use in order to enter the Setup program. Use the "Auto-detect" feature to detect the IDE-class hard drive(s) in your system. If the auto-detect feature does NOT find the hard drive(s), then power down and re-check your connections. If the computer still cannot find the hard drives (or floppy drives), then either your cables are bad, the controller is bad, the power to the drives is bad, or the drives themselves are bad. If the drives are recognized by the auto-detect feature, save the setup information and reboot. You can now begin loading DOS onto the PC, and begin software loading as well. Let the instructor know if you have any questions about this procedure.

## **IMPORTANT THINGS TO REMEMBER WHEN INSTALLING A MOTHERBOARD**

### **Plastic Standoffs**

When you install a motherboard, DON'T screw it directly down to the chassis of the case!

You mount it to the case, using the little plastic standoffs provided when you buy the case and power supply (if you don't have any, let me know, and I'll get you some). These standoffs keep the board from shorting out against the case, and they provide enough stability to the board so that you can push cards into the bus connections. If you don't install the standoffs correctly, any of the following things could happen:

- o the board touches against the case and shorts out, potentially damaging the motherboard and other installed components
- o you crack the motherboard when installing the cards into the bus connections
- o you allow the board to warp into an unnatural position by leaving it unsupported

The plastic standoffs have 2 ends to them: one that snaps into the holes on the motherboard, and one end that goes into little slots or grooves on the case. The idea is to have the bottom part of the standoffs slide into the pre-made holes on the case.

If you find that there is a need for a plastic standoff, BUT there is no hole on the case for it, cut the bottom off of the standoff, and let the standoff rest on the chassis. This will ensure that the motherboard doesn't touch against the case.

### **Grounding Points**

On most motherboards, there are CERTAIN holes that are designed as grounding points, that are intended for you to screw the motherboard down to a metal standoff on the case. These grounding point holes usually have a silvery-appearance around them. They are designed to take either a metal screw or a plastic standoff when mounting the board. When using a new case, you will find a bronze metal standoff (or two) in the package of screws that comes with the case. You will usually mount ONLY ONE of these bronze standoffs on the case, and mount the motherboard with a metal screw AT THAT ONE POINT ONLY.

If you mount a metal standoff and a screw into a hole that is NOT a grounding point, you can short out the motherboard and PERMANENTLY damage it. Be very careful to notice the appearance of the holes in the motherboard, and never screw the board down to a hole that is not a grounding point.

### **Power Supply Connections**

There are two power supply connections that connect to the motherboard. Each connector has a pair of black wires on them. The key in attaching these connectors is this: put the black wires together so that there are 4 black wires next to each other. This ensures that the power connections are installed correctly. Putting them on incorrectly can subject the motherboard to abnormal voltages and permanently damage the board.

When installing the power supply connectors to the motherboard, swing them in at an angle, and then gently press them down onto the board. The connectors have a design that forces you to hook them into the board, and then press them down. Some power supplies have these hook connectors cut off, allowing you to press the supply lines directly onto the board. In either event, be careful when installing power supply lines to the connectors on the motherboard.

If possible, use a dead motherboard and power supply to practice installing power connector; also, practice installing a board to the case with dead components.

## **NEW PC BUILDING CHECKSHEET**

Tools and parts needed:

- o Flat/Phillips screwdrivers
- o Needlenose pliers and/or wire cutter
- o Case/power supply (including screws, plastic standoffs, and drive mounting hardware)
- o Motherboard and CPU, floppy and hard drives, memory, drive and /or audio cables, video card, CD-ROM drive, sound card, fax/modem, CPU cooling fan

Software needed:

- o Bootable floppy disk with FDISK.EXE and FORMAT.COM installed on it
- o Checkit or a comparable diagnostic program
- o Disk Manager on floppy disk (if low-level format or custom drive partitioning is needed)
- o MS-DOS or Windows 7 operating system software

- o Any desired application software
- o Installation disks for the new sound card, CD-ROM drive, and video driver disk for Windows
- o An audio CD and a data CD-ROM disk (for testing purposes)

Step-by-step instructions:

- 1) Open the computer case;
- 2) Mount motherboard to case using plastic standoffs, as well as bronze standoffs and screws (be sure to use screws only on grounding points - use plastic standoffs elsewhere); the motherboard MUST be flat, steady, and not grounded out against the case;
- 3) Attach the power supply connection to the motherboard, and attach the speaker connection; test the motherboard to see that it is working correctly (it should give 3 long beeps, provided that no memory is installed); power down the PC;
- 4) Install the SIMMs (memory) onto the motherboard, and apply power again; you should get an audio error code (a series of beeps) indicating there is no video card installed; if there is no change, check the installation of the SIMMs; if correct, power down the PC;
- 5) Install the video card, and attach the monitor; power up the PC and watch the monitor to see that POST is testing the PC; if there is no change, check and/or replace the video card; if correct, power down the PC;
- 6) Mount all drives to the case; attach drive cables to the drives, and then attach the cables to the interface card or motherboard; be sure to install the cables so that the stripe on the cable is closest to pin 1 on the connector; be sure to attach power cables to all drives;
- 7) Power up the PC, and enter the CMOS setup program; enter into the program the exact types of hardware found in the PC (specifically video, memory size, floppy/hard drive parameters, etc.); save the information to CMOS RAM and reboot the PC;
- 8) Boot the PC from a bootable floppy disk; begin the installation process for the hard drives, and any other installed equipment (CD-ROM, sound card, fax/modem, etc.); install whatever desired operating system software and application software; use the installation checksheets for installing hard drives, CD-ROM drives, sound cards and fax/modems to assist you in the PC building process (see accompanying checksheets);
- 9) Run Checkit (or some comparable diagnostic software) to ensure that the PC is working

properly; also, run a burn-in test program for 12-36 hours to check the system under load conditions;

- 10) Replace the computer case - do NOT install the cover until you know the system is working properly.

### **Installation tips:**

- 1) Take things one step at a time. Do not rush, and do not proceed to the next step until you are sure that what you just installed is working properly;
- 2) Make notes of what you do, and observe the little things; for example, notice that the wires to the dashboard lights on the case usually are labeled to show what they are, and that the motherboard (and/or the motherboard documentation) indicates where the wires should be plugged; notice beep codes, error messages on the screen, and funny smells;
- 3) Be sure to have the 800-numbers for the hardware manufacturers available (whenever possible) for technical support if needed.
- 4) Refer to the various installation checksheets for different devices (hard disks, sound cards, etc.) to assist you in each step of the PC building process.

## **HARD DISK INSTALLATION CHECKSHEET**

Tools and parts needed:

- o Flat/Phillips screwdrivers
- o Screws, and perhaps drive mounting rails

- o Hard drive(s)
- o Correct drive cables (IDE or SCSI)

Software needed:

- o DOS and/or Windows 7
- o Bootable floppy disk with FDISK.EXE and FORMAT.COM copied onto disk (the student disk will work for this job)
- o Disk Manager on floppy disk (if low-level format or custom drive partitioning is needed)
- o Any desired application software

Step-by-step instructions:

- 1) Open the computer case;
- 2) If installing an IDE drive, set the master/slave jumpers on both the old AND new drives; for SCSI drives, set the SCSI ID jumpers to a unique SCSI ID number;
- 3) Write down the drive parameters (cylinders, heads, sectors per track, etc.) before mounting drive into PC (consult documentation or Mueller book if needed);
- 4) Physically mount the drive into case; use screws and/or drive rails as needed;
- 5) Attach the cable to the drive(s); be sure to attach the power cable from the power supply;
- 6) Power up the PC; enter the BIOS setup program and enter the drive parameters into CMOS (note: set SCSI drives to drive type 0 - not installed; the SCSI host adapter will identify the drives); save the new information to CMOS and reboot PC;
- 7) Boot the PC from a bootable floppy disk;
- 8) Run the FDISK utility and create a partition table on the new drive; if partitions exist on the new drive, backup the old data, delete the existing partition and recreate a new disk partition;
- 9) Once the computer re-boots from the floppy drive, run `FORMAT x: /S/V` (where x is the new drive letter) to format the new drive and give the drive a volume label; if the new drive is a second drive, the /S option may be omitted;
- 10) Install operating system software and application software as needed;



- 11) Replace the computer case - do NOT install the cover until you know the drive is working properly.

Installation tips:

- If the drive is larger than 528 MB, you will need to activate LBA (logical block addressing) mode in the system BIOS for the whole drive to be recognized. If your system BIOS does not have LBA mode built in, you will need to use Disk Manager to custom partition the drive, or you will need a controller card with a BIOS that has LBA mode built in, or you will need to upgrade the motherboard.
- If the number of bad sectors on the drive exceeds 5 percent of the total disk space, replace the drive - it's defective.
- Be sure to have the 800-number for the drive manufacturer available for technical support if needed.

## HOW TO INSTALL A SOUND CARD IN YOUR PC

- 1) Run a program like MSD.EXE or Checkit to find out what free interrupts you have in your PC BEFORE you install the sound card.
- 2) Read the manual for the sound card to see what interrupt level, DMA channel and port addresses you can use for the card; then set the IRQ jumpers (if necessary) for the sound card. (NOTE: some sound cards have their jumpers set by software, rather than by moving a physical jumper or switch; see your manual for details.) Most cards come factory configured the "proper way".

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

- 3) NOW install the sound card.
- 4) Run your installation program for the card to load the software drivers that will enable the card to operate.
- 5) Attach your speakers to the sound card. You will need external speakers for your sound card.
- 6) Run the test program that comes with your sound card; make sure it sounds right.
- 7) If the sound is scratchy, you may need to modify the DEVICE= statement in your CONFIG.SYS file to deal with this problem; consult your manual for details. You may also find you have a problem with one of the DMA chips (there are 2 in an AT-class PC) on your motherboard.
- 8) Test the sound card in Windows; the installation program should have created a program group that has audio utilities, and it should have modified Windows to play sounds. You should also be able to play audio CDs through your sound card (and CD-ROM drive) while in Windows.

Use the installation checksheet below as a guide when actually installing a sound card in your PC.

## **SOUND CARD INSTALLATION CHECKSHEET**

Tools and parts needed:

- o Flat/Phillips screwdrivers
- o Screws, and perhaps drive mounting rails
- o Sound card
- o Correct drive cables (IDE or SCSI)
- o Audio cable to attach CD-ROM drive to sound card

Software needed:

- o Installation disk for the new sound card
- o An audio CD disk (for testing purposes)

Step-by-step instructions:

- 1) Open the computer case;
- 2) Install the new sound card in any free 16-bit bus connection;
- 3) Attach the CD-ROM drive data cable to the IDE interface on the sound card (only if necessary);
- 4) Attach the audio cable from the CD-ROM drive to the sound card (if a CD-ROM drive exists);
- 5) Power up the PC; run the sound card installation/setup program from the floppy disk; when the install program is finished, reboot the PC;
- 6) Perform an F8 boot on the PC; go through the CONFIG.SYS and AUTOEXEC.BAT files to ensure that any sound card drivers load and recognize the card properly, and make sure that Windows (or Win95)

has been modified to recognize and use the sound card;

7) Test the sound card by playing an audio CD (with the included software), or play back any wave or MIDI files with the software included with the sound card;

8) Replace the computer case - do NOT install the cover until you know the card is working properly.

Installation tips:

- 1) Be sure to plug the speakers into the right connector on the back of the sound card; also, be sure to check the volume of the speakers (either through the sound card software, or by adjusting the volume control on the speaker or card);
- 2) Be sure to have the 800-number for the drive manufacturer available for technical support if needed.

## **HOW TO INSTALL A CD-ROM DRIVE IN YOUR PC**

- 1) MOST non-SCSI CD-ROM drives available today use the ATAPI interface, which is another name for the IDE interface used in most hard drives. With these drives, you can plug your CD-ROM drive into the same cable as your hard drive.

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

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

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

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

**Standard interrupt levels for a CD-ROM device are IRQ 10 or 11; standard DMA channel assignments**

**are DMA 5, 6 or 7; standard port addresses are either 300 Hex or 340 Hex.**

Finally, connect the audio cable from the CD-ROM drive to the drive interface OR your sound card.

- 3) Run the installation program that came with your CD-ROM drive; it will edit your CONFIG.SYS file to load the driver program needed to recognize the drive at the correct IRQ level, DMA channel and port address. Also, the installation program will load a program from your AUTOEXEC.BAT file called MSCDEX.EXE; this is the MS-DOS extension driver for CD-ROM drives that allows MS-DOS to use the drive.
- 4) Re-boot your PC; it should now recognize your drive.
- 5) Once the drive is working, get a print-out of your CONFIG.SYS file for safe-keeping. Many software installation programs for CD-ROM programs may change your CONFIG.SYS file, and accidentally render your drive inoperative! Have that copy hidden somewhere for safe-keeping.
- 6) You may now replace the lid on your PC's case: the drive is ready for use.
- 7) Be sure to keep your documentation handy; strange things often occur when using CD-ROM drives and their associated software.

Use the installation checksheet below as a guide when actually installing a CD-ROM drive in your PC.

#### **CD-ROM DRIVE INSTALLATION CHECKSHEET**

Tools and parts needed:

- Flat/Phillips screwdrivers
- Screws, and perhaps drive mounting rails
- CD-ROM drive
- Correct drive cables (IDE or SCSI)
- Audio cable to attach CD-ROM drive to sound card

Software needed:

- Installation disk for the new CD-ROM drive
- An audio CD and a data CD-ROM disk (for testing purposes)

Step-by-step instructions:

- 1) Open the computer case;
- 2) If installing an IDE-class CD-ROM drive, set the master/slave jumpers on both the old AND new drives (normally set the jumper to slave on the CD-ROM drive); for SCSI drives, set the SCSI ID jumpers to a unique ID number;
- 3) Attach the CD-ROM drive to the primary IDE interface cable, or install a new cable from the drive to the secondary IDE interface on the controller or motherboard (if one exists), or attach the data cable to the IDE interface on the sound card (if one exists); if the CD-ROM is a SCSI type, attach the data cable from the SCSI host adapter;
- 4) Attach the audio cable from the CD-ROM drive to the sound card; if no sound card exists in the PC, leave the audio cable attached to the CD-ROM drive (in anticipation of a future sound card addition); be sure to attach the power cable from the power supply;
- 5) Physically mount the drive into the case; use screws and/or drive rails as needed;
- 6) Power up the PC; run the CD-ROM installation/setup program from the floppy disk; when the install program is finished, reboot the PC;
- 7) Perform an F8 boot on the PC; go through the CONFIG.SYS and AUTOEXEC.BAT files to ensure that the CD-ROM driver (in the CONFIG.SYS file) loads and recognizes the drive, and that MSCDEX.EXE (in the AUTOEXEC.BAT file) assigns the CD-ROM drive a unique drive letter; if running Windows95, MSCDEX may not appear in your AUTOEXEC.BAT file (Win95 has built-in support for CD-ROM drives);
- 8) Test the CD-ROM drive by installing a program or reading a file from a data disk, or play an audio CD on the new drive;
- 9) Replace the computer case - do NOT install the cover until you know the drive is working properly.

Installation tips:

- 1) Be sure to note where pin 1 is on the cable connector - plugging in the cable backwards may cause the hard drive to shut down; also, be sure to set the master/slave jumper on the drive to slave, regardless.
- 2) Be sure to have the 800-number for the drive manufacturer available for technical support if needed.