Computer Repair with Diagnostic Flowcharts – Free eBook Edition

Abridged from published book to accompany the eight hardware flowcharts on the FonerBooks.com website.

The linked website versions of the flowcharts are interactive, ie, click on the diamond decision symbols and the browser shows the relevant text. This eBook is formatted for printing, so you'll get pages that can be stapled together, like an abridged version of the book. The published book, "Computer Repair with Diagnostic Flowcharts Revised Edition" is available through Amazon or Barnes&Noble.com for $14.95.

The eBook is formatted for two side printing. Print the odd pages, shuffle the paper, and print even pages on the back. It will come out like the published book, with the flowchart symbols in the outer margins. The blank pages are necessary to keep the printing correct. Before wasting 32 sheets of paper, try printing a few pages on both sides to make sure you are doing it correctly.

Six laptop troubleshooting flowcharts online at:
http://www.daileyint.com/hmdpc/repair.htm

Morris Rosenthal

Flowcharts produced with Microsoft Visio Standard

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Instructions

This book was not designed to be read from cover to cover. At the core of the book are seventeen diagnostic flowcharts, and the sole purpose of the text is to expand upon them. The flowcharts themselves are necessarily written in short-hand form, to fit a meaningful number of decision points on a page. A linear text is simply not possible due to the decision tree structure of the flowcharts. The diamond shape for each decision point in the flowchart is repeated in the outer margin of the following pages. This marks the section of text that explains the action in more detail. Do not read beyond the designated section without returning to the flowchart to determine the next step.
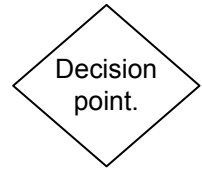
The ovals in the flowcharts contain instructions or suggestions. If a suggestion like "reseat the cable" doesn't work, the best course is to return to the previous decision point and continue with the diagnostic down the other branch. These charts are designed to push parts swapping to the end of the diagnostic procedures wherever possible, so readers without a stock of spare parts will have the best chance to repair the problem without spending money. You should always label any parts you remove from a machine as "suspicious," and if it becomes apparent that they are truly faulty, dispose of them.
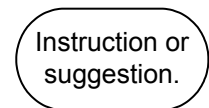
The "home plate" symbol is used in flowcharts to transfer control to an off-chart point. Most of the flowcharts in this book have multiple decision paths that will send you to a different flowchart for a different hardware sub-system. As with the suggestion oval, if you've already been there, you can retreat to the last decision point and determine if following the other branch makes sense.
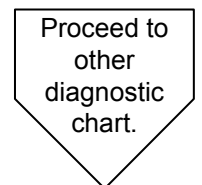
Diagnosis is an art. There's no point in having the world's leading brain surgeon poking around in your skull if the problem is with your liver. This is exactly analogous to what happens when techs or hobbyists troubleshoot PCs without following some intelligent diagnostic procedure. The most experienced techs are sometimes some of the worst diagnosticians, because they're overconfident in their troubleshooting abilities. If you work on a given brand of PCs for a few months and you find that 90% of the problems encountered are due to a bad power supply, you start attributing all PC problems to power supplies. If you'd been working in a different shop on a different brand, you may have concluded that 90% of all computer problems were due to bad RAM, etc. You should always approach each new problem with an open mind and look at the most basic possibilities before jumping to conclusions.

Decision point.

Instruction or suggestion.

Proceed to other diagnostic chart.

This book focuses on ATX PCs with a modern plug-n-play motherboard and BIOS. These PCs first appeared in the mid-90's and still accounted for all of the standard PCs sold in 2008. ATX computers are turned off and on by a switch on the front panel of the PC which tells the motherboard to instruct the power supply to come full on. An ATX power supply is always supplying a trickle of current to the motherboard as long as it's plugged in and the override switch on the back of the supply isn't turned off. To avoid the risk of damaging components when working in the PC, unplug the power supply before making any changes inside the case.

Since unplugging the PC removes the ground, this increases the risk of damaging components with a static electric discharge. In over 20 years of working on PCs I've only zapped one component that I know of, a SCSI hard drive, and that was in a high static environment. Don't work in a dry area with a rug or rub Styrofoam all over your body before picking up a part. Don't work in an area where you frequently experience static electric shocks. It's good to form the habit of touching some exposed piece of metal, even if it's not grounded itself, before picking up static sensitive devices. If you don't have much experience working around computer parts and the static threat worries you, buy a static bracelet and tether at the local electronics store for a few dollars.

You need to have a basic knowledge of the terminology of computers and the physical appearance of PC components to benefit from these flowcharts. This book is not for beginners, but we have added links to illustrated procedures on the publisher's website, fonerbooks.com. Many of the procedures described in this book require a basic knowledge of working with electronics. Procedures describing live power and bench testing may result in harm to the computer hardware, the tester (you), and the environment (your house).

The vast majority of ATX PCs run some version of Microsoft Windows. Therefore, when it's necessary to refer to the operating system, the references are usually to Device Manager, the standard Windows hardware manager through Windows Vista and likely beyond.

Power Supply Failure

Power comes on?

— Yes → **Live screen?**
— No → **Good AC power source?**

Live screen?
— No → Proceed to Video Failure chart.
— Yes → **New build?**

New build?
— Yes → Check power requirement vs rating.
— No → **Boot on 2nd try?**

Boot on 2nd try?
— No → **Hear any beeps?**
— Yes → Premature power_ok signal. Try different power supply.

Hear any beeps?
— No → **New hardware installed?**
— Yes → Proceed to Motherboard Failure chart.

New hardware installed?
— No → (to Hard drive spin up?)
— Yes → Remove latest addition and retry. Test, replace power supply.

Good AC power source?
— Yes → **Is 110/220 V set?**
— No → Use live outlet.

Is 110/220 V set?
— Yes → (to Installed motherboard lead?)
— No → Select proper voltage on rear of power supply.

Installed motherboard lead?
— Yes → **Power switch fail?**
— No → Check manual and motherboard silkscreen. Connect lead from front panel switch.

Power switch fail?
— Yes → Replace switch or substitute front panel reset switch, if available.
— No → **Power supply connections to motherboard correct?**

Power supply connections to motherboard correct?
— Yes → (to Hard drive spin up?)
— No → Remake motherboard power supply connections.

Hard drive spin up?
— No → **Spin up on other lead?**
— Yes → **Bad adapter on bus?**

Spin up on other lead?
— Yes → Defective power supply lead or connector.
— No → Try drive in test PC.

Bad adapter on bus?
— No → **Powers motherboard on bench?**
— Yes → Strip system down to video adapter only. See Box A, on Conflict Resolution chart.

Powers motherboard on bench?
— Yes → Either you have a short circuit in the case or a geometry problem placing an unacceptable stress on the motherboard. It's also possible that the video adapter was never seated, due the bracket position.
— No → Replace power supply.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

Power Supply Failure

Or cut and paste http://www.fonerbooks.com/power.htm

Power Supply Failure

The first step in power supply diagnostics is determining whether or not the power comes on. How can you tell if the power is on? Can you hear fans turning and drives motors spinning up, see little lights on the front of the CPU case or hear any beeps? If the system case is hot (if you get a shock) pull the plug immediately - you have a ground failure and a short. If your hearing isn't good, you can always check to see if the power supply fan is creating a breeze. Monitors are powered independently, so unless you're looking at a notebook PC, a live screen doesn't indicate a working power supply.
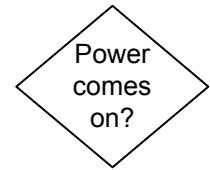
If the power doesn't come on, the first thing to check is that you have a live power source. You don't need a DVM (Digital Volt Meter) to check if your power outlet is live. Just unplug the power supply cord and plug in a lamp or a radio. If you are using a power strip, don't assume the socket you are using is good because the other outlets are working and the power strip status light is on. Many power strips I've encountered in the field have at least one bad outlet, and working outlets have been known to fail for no particularly good reason. Power supply cords very rarely fail, but it's possible for the female connector on the power supply end to back out of the socket. Make sure that both ends of the power supply cord are fully seated in the outlet and the power supply, respectively.
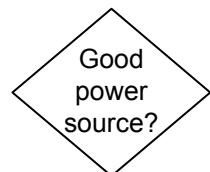
Check to make sure the correct voltage (110V/ 220V) is selected on the power supply. While this should never come up with a PC that's just been sitting on the desk, if you've replaced the power supply or moved the PC, it's always a possibility. This small red slide switch is located on power supply, usually between the power cord and the on/off override switch on the back of the case. Unplug the supply and select the proper voltage for your country. If you tried to power up with the switch set to 220V in a country using 110V, the system should be OK when you correct the voltage. If you tried running on 110V in a 220V country, you've probably blown a fuse in the supply (at the least), or damaged the supply and possibly other components.
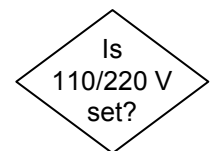
If pressing your power switch doesn't immediately shut down the PC, that's normal for ATX systems. The action of the power switch is programmable and is controlled through CMOS Setup. The default operation for most power switches requires you to hold the switch in for three to five seconds before the system will power down. This allows use of the power switch to wake the PC from some power saving "sleep" or "stand-by" modes, depending on CMOS Setup power

Power comes on?

Good power source?

Is 110/220 V set?

Installed motherboard lead?
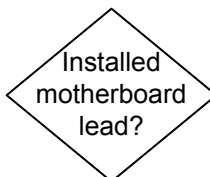
management settings. If the problem is that the operating system can't turn off the PC when you shut down, it's likely a bad setting in power management or a corrupted file in the operating system.

One very good reason for the power supply to fail is an unconnected power switch. The power switch lead on ATX PCs, often labeled PW or PW-ON, runs from the front panel of the case to a connector block on the motherboard. This issue should only come up if you've been working in the case (the leads can pull off the connection block very easily), or if you've replaced the motherboard. The switch isn't polarized so it doesn't matter which way it goes on the motherboard posts, but it must be on the correct two posts. The proper location is usually printed right on the motherboard next to the connector block, and you can also consult the motherboard documentation. In cases where the documentation provided with the system and the information printed on the motherboard don't agree, I go with the motherboard.
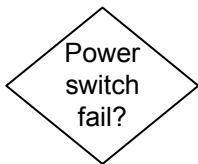
Power switch fail?

Check the switch operation with a Digital Volt Meter on the continuity or resistance setting. On all ATX systems, the power switch is really just a logic switch that tells the motherboard, to which a trickle of live power is always supplied, to instruct the power supply to come fully alive. If your power supply features a heavy cord running forward to a large switch on the case front, with four connections, you have an old AT style supply and potentially deadly live line voltage is present at the switch. These procedures do not apply to the obsolete AT power supplies. When I'm working on an ATX system and don't have a tester handy, I short the two pins on the motherboard with a screwdriver, where the logic switch from front panel should be attached, and see if the system starts. This is a "live power" test. Don't do it if you may get startled and bash the screwdriver into something should the system power up, because there's no way to repair short-circuit or gouging damage once it's done. If the switch is bad and you don't have a replacement switch, check for a reset button on the front panel. You can usually get away with using the reset button for the PW-ON logic switch, and live without the hard reset.

Power supply connections to motherboard correct?
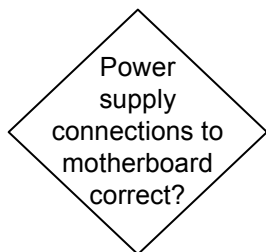
The power supply will to fail to operate if the power to motherboard isn't connected. Check that the 20 or 24 pin main ATX power connector and any additional motherboard power connections, such as the 4 pin ATX 12V supply (8 pin on some systems), are properly connected and seated. The latching mechanism for the standard ATX connector is counter-intuitive. You have to push in on the latch at the top to release it at the bottom, at which point the connector should pull off with almost no force required. You should hear or feel the latch click in when the connector is seated.
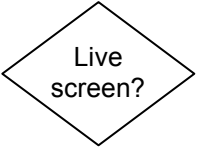
Remove the power leads to the drives to ensure that you aren't trying
to power up into a short. The motherboard power must remain
connected to activate the ATX power supply. If you have a DVM
(Digital Volt Meter) and experience working around live circuitry, you
can try checking the DC voltages at the connectors to see if they are
live, or within 5% of the rated voltage. I'm not advising you do this
live testing, as it's much easier and safer to try swapping in a new
power supply. Unless you have a special testing fixture, you must
leave the connectors attached while checking, which requires an
exposed connector surface or a cheater lead. This is necessary because
switching power supplies won't operate properly without a load, either
failing to come on or even self-destructing (in extreme, low quality,
instances). I just poke the DVM probes into the top of the 24 wire
connector at the motherboard, since there's usually room next to the
wire to get down to the conductor.

ATX Version 2.2 - 24 wire motherboard connector

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11	Pin 12
3.3 V	3.3V	Gnd	5V	Gnd	5V	Gnd	P _ O K	5VSB	12V	12V	3.3V
Oran	Oran	Blk	Red	Blk	Red	Blk	Gray	Purp	Yell	Yell	Oran
Oran	Blue	Blk	Green	Blk	Blk	Blk	White	Red	Red	Red	Blk
3.3V	-12V	Gnd	P_ON	Gnd	Gnd	Gnd	-5V	5V	5V	5V	Gnd
Pin 13	Pin 14	Pin 15	Pin 16	Pin 17	Pin 18	Pin 19	Pin 20	Pin 21	Pin 22	Pin 23	Pin 24

The color scheme used for the voltages in the 24 pin connector holds
for the other ATX standard power supply connectors. However, brand
name manufacturers, especially older Dells, often used proprietary
power supplies and made up their own color coding, so I wouldn't
throw out a power supply that supplies 5V where you think it should
supply 3.3V. It's more likely a proprietary design than a failure.

The 5V on Pin 9 is always present when the power supply is plugged
in. This connection supplies power to the various PC circuits that
operate even when the PC is turned off, such as "Wake on Modem" or
"Wake on LAN." It's also the reason you should never work in the PC
with the power supply plugged in, unless you can remember to turn off
the override switch every time. This live power is supplied to the
adapter slots, so replacing adapters with the power cord plugged in
may damage the motherboard or adapters. Even though the drive leads
aren't powered with the system turned off, you might drop a screw
while working on a drive. If that screw lands in just the wrong place,
like an open bus slot, it could create a short and damage the
motherboard.

Live
screen?

Assuming your PC is connected to a monitor, the next question is, do you have a live screen? Does text or a splash screen appear? A message saying "Please connect monitor" or "No video signal detected" counts as a "No" answer in this case. If the screen is live, but you see multiple images or endless scrolling, the video adapter is providing signals that cannot be interpreted by the monitor. This usually occurs when you attach an old monitor to a new PC and the monitor doesn't support the refresh rate at the screen resolution selected in the Windows settings.

New
build?

Newer components like quad core processors and dual PCI Express video adapters have doubled the power requirements of typical gaming PCs. An entry level ATX power supply for a PCI Express gaming PC these days is 600W, and power supplies ranging from 750W to 1000W are no longer unusual. The primary culprits are multi-core CPUs that can consume anywhere from 10W to 50W or more per core, for a total CPU consumption as high as 200W in a single processor system. Meanwhile, PCI Express graphics cards for gaming can pull as much as 200 Watts by themselves, or double that in a dual card configuration.

While PC power supply manufacturers boast about their power rating, as it's their main selling point, manufacturers of video cards and other components don't trumpet their power consumption. You may have to do a little math to work it out. Sometimes they give the peak current requirement in Amps (A) at the supply voltage, usually 12V, so you multiply the two numbers for the power consumption in Watts. All of the high end video cards require more power than can be supplied through the PCI Express slot on the motherboard, so they are fed directly from the power supply with one or two 6-pin PCI Express supplementary connectors, or standard 4-pin Molex connectors, the kind used for non-SATA drives.

Boot on
2nd try?

If the power supply comes on but you don't get a live screen, switch off and try again. You may have to hold the power switch in for five or more seconds before the system powers back down. If it fails to power down, you can turn off the switch on the back of the power supply, turn off your power strip, or unplug the cord. A PC that boots on the second or third try is most likely suffering from a quick power_ok (or power_good) signal, coming on before the power supply has stabilized. The presence of the power_ok signal tells the motherboard that the power supply is stable, while its absence tells the motherboard to stay off to protect itself. It's possible the power supply isn't quite up to the current ATX standard or the motherboard is a little too demanding about timing. Booting twice every time you want to turn on the PC isn't an ideal situation, so unless you leave it on all the time,

look into buying a higher quality power supply, ideally one recommended by the motherboard manufacturer.

Beep codes are part of the PC's Power On Self Test (POST) routine. One beep means the system has passed the test and the BIOS believes that the CPU and memory and video are functioning properly. All other beep codes vary by BIOS supplier and system brand, but endlessly repeating slow beeps often indicate RAM failure, so shut down and try reseating the memory module(s). A repeated string of beeps, either 3 or 9 beeps long, is frequently video failure, so unplug the power and try reseating the video adapter. If you are getting beeps with a live screen, the problem is unlikely to be power supply related. Proceed to the Motherboard, CPU and RAM Failure diagnostics.
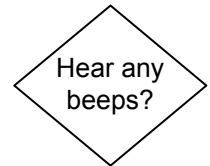
If you don't get any beeps, make sure the case speaker is connected and check for beeps again. If the motherboard lacks a connection point for a case speaker near the power switch and LED block, it probably employs an onboard piezoelectric speaker. If you have recently added any new components to the system, they may be overtaxing the power supply or causing a short circuit. This includes both adapters and drives. The first step in any failure situation is to try undoing the last change you made. I once encountered a system which powered up but failed to initialize the video adapter when the secondary IDE ribbon cable was connected backwards to a CD drive! Although the component you just added may have worked in another system, it doesn't mean you hooked it up properly, that it's compatible with the current PC, or that it didn't fail in the interim.
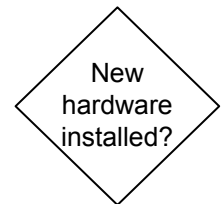
Common power supply problems unrelated to the boot process are noisy operation and unstable voltages, both of which are a reason to replace the supply. There are two common noise problems associated with power supplies, noisy fans and whistling capacitors. Noisy fans can be replaced, but only if you're a reasonably competent technician because you can really get a nasty zap from the stored energy in the capacitors even when the power supply is unplugged. Make sure your noisy fan problem isn't due to something silly like a piece of paper poking in through the fan grille before you rush out and buy a replacement. If your dog won't stay in the room when the computer is turned on or if your kids hear a high pitched whistling that you don't, it's probably a capacitor. To determine whether the capacitor is in the power supply or elsewhere in the system will require a process of elimination or some parts swapping.

Unstable voltage problems are real ghosts in the machine, and can mimic all sorts of other problems. If you get into a flaky failure situation that you can't diagnose and you've already started

Hear any beeps?

New hardware installed?

Illustrated ATX power supply replacement:

www.fonerbooks.com /r_power.htm

troubleshooting (i.e. swapping parts), you may as well try a new power supply as well. I've seen power supplies produce some really bizarre failures, like a PC that reboots when you set your coffee cup down too hard on the table. The most pervasive of the unstable power supply problems are random lockups or spontaneous reboots. Modern motherboards have some ability to regulate the power they receive, but it's got to be within a reasonable range. When it starts overshooting the limits, the system may freeze or shutdown the motherboard to protect itself.

Hard drive spin up?
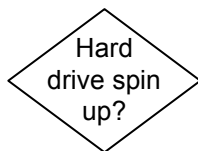
As soon as the PC powers up, you should be able to hear the hard drive motor spin the drive (like a very, very, quiet jet taking off) and the read/write head seeking (a gentle clunking sound). If you're absolutely baffled as to whether or not the drive is spinning up, due to background noise or hearing problems, you can resort to feeling the drive cover. If that still doesn't do it, I power down, remove the drive cage or the drive itself, and hold it firmly by the edges (not touching any exposed wires or the circuit board on the bottom) while powering up. The drive resists twisting movements like a gyroscope if it's spun up. Don't play with it. If you move too fast or touch the circuit board to something that can cause a short, you'll damage the drive. Just power down, reinstall, and continue with the diagnostics.

If system power is coming on but the drive still isn't spinning up, make sure that your power lead is seated in the drive power socket. The old fashioned Molex connectors on pre-SATA drives should go in a good half inch or so. It does take a good deal of force to seat the cheaper leads in some drives. Try another lead, even if you have to disconnect another drive to get it. Try another drive. At this point it's still quite possible that the power supply is defective, but if you have a drive that you know spins up, it's a good way to eliminate one possibility. As long as you don't smell smoke coming out of the drive you can test the drive in another system. If you are using SCSI rather than IDE hard drives, check the documentation for a jumper that suppresses spin up on boot. SCSI drives offer this option because you can install as many as 15 in a single system, and if they all tried to spin up at once it would swamp any power supply. Normally, the SCSI host adapter will spin them up in order of their SCSI ID.

Spin up on other lead?
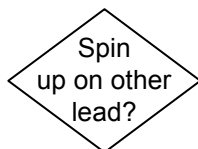
If system power isn't coming on, disconnect all drives, one at a time, and try powering up after each change. If the system powers up, you've found a faulty drive or a faulty lead from the power supply. If all of the SATA power connectors are dead, you can try running an SATA drive with an adapter on an old 4 pin Molex connector, or vise versa. If the system won't power up with all drives disconnected, start removing adapters, one at a time, leaving the video for last. Unplug

power cord before removing each adapter, then reconnect to power up. If the system powers up, replace all adapters except the last one removed before power came on. If power still comes on, try the last adapter you removed in different slot before giving up on it.

If you find an adapter that actually prevents the system from powering up, it must be replaced. If you are running with dual PCI Express video cards, try running with just one and then just the other. If you have a single video card slot, whether PCI Express or AGP, it could be that slot is faulty. Another possibility is that the adapter is keyed as universal but is installed on a new motherboard that expects low voltage AGP adapters (AGP 4X or 8X).

Bad adapter on bus?

Once you've eliminated the drives and the adapters, one of the few remaining possibilities is a motherboard short. Remove the motherboard and check for a standoff or screw located in the wrong place or rolling around loose. I often build out systems on the bench without a case, supporting the motherboard on a static proof bag over a cardboard box or some similar arrangement to give the adapters room to seat. This method eliminates any case mounting issues from the diagnostics process, but it introduces all sorts of risks, not the least of which is absence of the case ground.

Powers motherboard on bench?
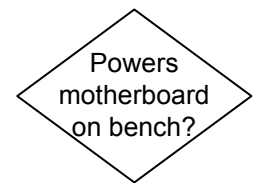
Normally, a short circuit will result in a burnt smell and a ruined motherboard, sometimes damaging any of the attached components (memory, CPU, adapters) as well. In many instances, you'll be able to figure out which component is ruined by the presence of burn marks or a strong odor of smoke coming from the component, though if it happens in a closed case, the smoky smell can stick to everything. If you can't locate a failed component by visual inspection, you need to have access to a test-bed system (an inexpensive but completely functioning PC for testing questionable parts). Don't test parts that may be fried in a good system, because some types of failures will cause damage to the next machine.

If you've reached this point without getting the system to power up, you probably have a defective power supply or motherboard. Try replacing the power supply first since they're cheaper than motherboards. Repairing power supplies requires a good knowledge of electronics as there are usually "no user serviceable parts." Even when power supplies are unplugged, they can give nasty zap from stored power in the electrolytic capacitors. If the power supply or motherboard is new, they may be incompatible with one another due to poor adherence to ATX standards or support for different generations of the ATX standard

Video Failure

Does system power up?
- Yes → (Live screen?)
- No → Proceed to Power Supply Failure

Live screen?
- No → Monitor power on?
- Yes → "No power" displayed?

Monitor power on?
- No → Check monitor power source. Make sure cord is fully seated in the monitor socket.
- Yes → Controls in middle of range?

Controls in middle of range?
- No → Adjust brightness and contrast.
- Yes → Hear a string of beeps?

"No power" displayed?
- Yes → Connect video card power inside PC
- No → "No Signal" displayed?

"No Signal" displayed?
- No → Freezes on BIOS Screen?
- Yes → Video cable secure?

Hear a string of beeps?
- No → Video cable secure?
- Yes → Adapter seated?

Adapter seated?
- Yes → RAM seated?
- No → Reseat video adapter, secure.

RAM seated?
- No → Reseat RAM on Motherboard.
- Yes → Cable damaged, pins bent?

Video cable secure?
- No → Check both ends of video cable.
- Yes → Monitor tested?

Monitor tested?
- Yes → Cable damaged, pins bent?
- No → Test monitor on good PC or laptop.

Cable damaged, pins bent?
- Yes → Repair or replace video cable.
- No → Any other adapters installed?

Testing with a different technology video adapter (PCI vs PCI Express) doesn't prove the card slot is good

Any other adapters installed?
- No → Live with new video adapter?
- Yes → Live with lone video adapter?

Freezes on BIOS Screen?
- Yes → Any other adapters installed?
- No → Proceed to Video Performance chart.

Live with new video adapter?
- No → Proceed to Motherboard Failure chart.
- Yes → Try old adapter in other system before chucking.

Live with lone video adapter?
- No → Live with new video adapter?
- Yes → Proceed to Conflict Resolution chart.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

Video Failure

Or copy and paste:
**http://www.fonerbooks.com/video.htm**

Video Failure

Is the system power coming on? Can you hear fans turning and drive motors spinning up, see little lights on the front of the CPU case, hear any beeps? We're talking about system power here, not the monitor power. If the system isn't powering up, or if you aren't sure whether or not it is, go to the Power Supply Failure chart now.
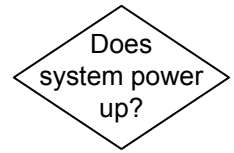
Does anything at all show up on the screen with the monitor power on, or is it just as black as before you powered on the CPU? We aren't demanding any signs of intelligent life in this case, any sign of life will do.
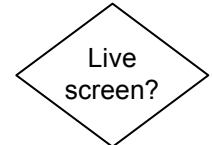
Assuming the system power comes up, does the monitor power come on? Monitors have a status LED on the front bezel that should show green, orange, or blinking if the monitor is powered on. You can also hear older monitors power on with a gentle sound, though I can't describe it beyond saying it's the sound of a CRT tube warming up. Make sure the monitor is plugged into a good outlet by testing the outlet with a lamp or any other device that will prove beyond a doubt that the outlet is good. Make sure that the power cord is either permanently attached at the monitor end or that it is seated fully in the socket, since partial cord insertion is the most common failure for monitors with detachable cords.
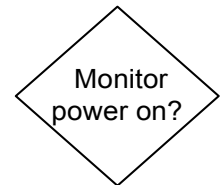
LCD displays don't make any sound when you turn them on, but they don't always have a simple power cord, either. Some LCD monitors are powered by an external transformer, which in turn is powered from a regular AC outlet. If the LCD display doesn't show any signs of life, make sure that the cords into and out of the transformer are fully seated. Some transformers are equipped with a status LED to show when they are operating, though you can also check for live output with a DC voltmeter. The power connection to the LCD display is often awkward to inspect, recessed into the back of the display. The important thing is to make sure it is started correctly, then seat it all the way.

Few things related to computers are more embarrassing than taking your monitor for repair and finding out that the brightness was turned all the way down. This frequently happens with exposed dials when you pick up the monitor and move it, though a prankster might also turn down the settings when they're concealed behind a pop-out door right under the screen. Make sure that manual brightness and contrast controls on the monitor are set somewhere in the middle of their range, since it's not always obvious which way is maximum or minimum. If the monitor is alive, turning the brightness and contrast all the way up
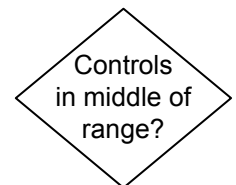
will often result in the screen lighting up a little. The easiest way to check if the monitor is good is to simply attach it to another working PC.

"No power" displayed?
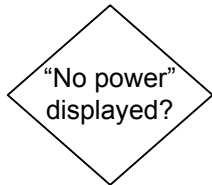
If you see a message on the screen that includes "power" in it, like: "attach graphics card power", "no power to video adapter", etc, it means that you have a PCI Express or older AGP video card that requires more power than the motherboard can supply through the bus. This means you need to run a power cable directly from the power supply to the video adapter, inside the PC. If it's a new build, you may have forgotten or not seated the connector firmly. If it was a working PC, either the power supply lead has failed, the power supply itself has problems, the cable worked loose, or some hardware on the video card has failed.

Replacing an AGP video adapter

www.fonerbooks.com /r_video.htm

Earlier video cards that required additional power from the power supply usually took a Molex connector, the same 4 pin connector used to power non-SATA drives. Newer power supplies include one or two six pin PCI Express supplementary connectors designed for power hungry graphics cards. Some PCI Express cards, in the absence of a six pin supplementary lead, will accept two 4 pin Molex leads.

"No Signal" displayed?
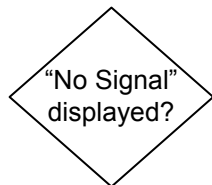
Most new monitors will display something such as "No signal source," or "Attach video signal," as long as they are healthy, and powered on. These messages should appear even if the PC or video adapter is dead. This is actually one of the more useful innovations in monitor technology, because it offers definitive proof that the monitor or LCD display is alive and most likely capable of displaying an image if a video signal was present. Unfortunately, it only proves something by its presence, since older monitors and cheaper models may not display anything at all.

Video cable secure?
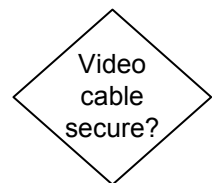
Make sure the 15 pin video signal cable (3 rows of 5 pins each) is seated squarely on the video port on the back of the system. The hold-down screws on either side of the connector should be screwed in all the way, but not made up too tight. If the video cable is connected correctly, remove it and inspect the connector for damage.

Monitor tested?

Before making yourself nuts, test the monitor on another PC or laptop. If you use a laptop to test the monitor and it doesn't automatically detect an external monitor when booting, use the "F" function keys along the top of the keyboard to tell the laptop to shift to the external display. Remember that we are testing just to see if the monitor is live, it doesn't matter if the screen settings are wrong and the display looks funny. If it doesn't work on a known good computer, the problem is with the monitor, not your PC. If a faint image is detectable on an

LCD screen, the problem is with the backlight or the inverter that powers the backlight. A loud buzz coming from an LCD monitor is most likely the inverter circuit failing, though it can go on getting louder for years before it pops.

Look carefully at the pins in the connector to make sure none of them are at an angle or flattened against the bottom. Note that missing pins in a video cable are the norm, usually the monitor ID pins. It's great if you have a spare video cable and a monitor with a detachable cable, but most monitors have an integrated cable (doesn't detach) and most people don't have a spare anyway. You'll usually have to settle for visual inspection for whether the cable may have been crushed or breached.

Cable damaged, pins bent?
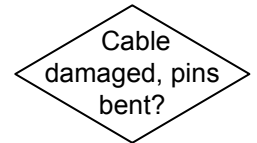
If you see that a pin in the connector is bent, you can try to straighten it very slowly with tweezers or fine needle nose pliers. If a pin breaks, you can buy a replacement connector and solder it on with a fine soldering iron and infinite patience. You'll also need a heatshrink gun and tubing if you want to do it right. The last time I did one it took me almost three hours, though I didn't really have the right soldering iron tip. I don't recommend making your own DVI connector.

Video Connector Pinout	8 - Blue Return (coax shield)
1 - Red	9 - No-Connection
2 - Green	10 - Sync Ground
3 - Blue	11 - Monitor ID
4 - Monitor ID (Note: pins for ID bits sometimes not present)	12 - Monitor ID
5 - Ground	13 - Horizontal-Sync
6 - Red Return (coax shield)	14 - Vertical-Sync
7 - Green Return (coax shield)	15 - Monitor ID

Do you hear a string of beeps? Healthy PCs should beep once or twice when they are turned on and pass their Power On Self Test (POST) routine. While different BIOS manufacturers use different beep codes to identify failures, a repeating string of beeps (three or nine in a row) is a common indicator of video card failure.

Hear a string of beeps?
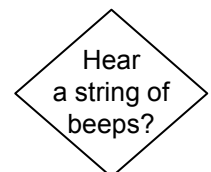
Adapter seated?

Check whether or not the video adapter is properly seated. This is an in-the-box check, so make sure you unplug the power cord to the system first. This doesn't apply to motherboards with built-in video. Whether or not the video adapter appears to be seated properly, reseat it. Remove the video adapter hold-down screw, remove the adapter, then reseat it in the slot, pushing down evenly. Be careful that putting the hold-down screw back in doesn't lever the front edge of the video adapter (the end away from the screw) up a fraction of an inch out of the slot, because that's all it takes if there's no hold-down latch.

RAM seated?

If reseating the card doesn't clear up the beeps, it's probably a failed video adapter or RAM on the motherboard. You can power down and try reseating the RAM at this point, without going all the way through the motherboard diagnostics. There used to be beep codes for all sorts of component failures, but most of those components have long since been integrated into the motherboard and can't be replaced if they fail.

Freezes on BIOS Screen?

Does the system get as far as showing the BIOS screen and locking up? By BIOS screen, we're talking about the text information or brand-name graphics that appear on the screen in the initial boot stages. A system that freezes up at this point is rarely suffering from a video failure, though a conflict between the video card and another installed adapter is still possible.

Any other adapters installed?

Did you install any new adapters immediately before the problem appeared? With the power disconnected, remove any other adapters, one at a time, then reconnect power and attempt to reboot after each removal. Locking up on the BIOS screen is often due to an adapter conflict, but if removing the other adapters doesn't solve the problem, proceed to Motherboard, CPU and RAM Failure.

Live with lone video adapter?

Do you get a live screen, or at least move past the BIOS screen, with all the other adapters removed? If so, the problem is either a bad adapter preventing proper operation of the bus or an adapter conflicting with the video card. In either case, you can reinstall the adapters one at a time, powering up after each one, troubleshooting the problem by process of elimination. Don't forget to unplug the system each time before taking any action inside the case.

Live with new video adapter?

If the motherboard is a new upgrade, try the video adapter in another system before trashing it, since it could be a simple incompatibility. If installing a new video adapter doesn't solve your "dead screen" problem, it's probably a motherboard related problem, even though you got to this point without any beep codes. Proceed to Motherboard, CPU and RAM Failure.

Motherboard, CPU, RAM Failure

Live Screen?

No → **Power diagnostic done?**

Yes → **Freezes on boot screen?**

Power diagnostic done?
- No → Proceed to Power Supply Failure.
- Yes → **Video diagnostic done?**

Video diagnostic done?
- Yes → **RAM matched, seated?**
- No → Proceed to Video Failure diagnostic chart

RAM matched, seated?
- No → Reseat RAM, positive lever lock. Install pairs if required.
- Yes → **CPU seated flat?**

CPU seated flat?
- Yes → **Fan on heatsink active?**
- No → Reseat CPU and heatsink.

Fan on heatsink active?
- No → Check fan power point, (fan1), replace.
- Yes → **Hear beeps?**

Hear beeps?
- No → **Default motherboard settings?**
- Yes → Replace RAM with type listed in motherboard documentation.

Default motherboard settings?
- No → Restore default motherboard settings with jumpers or switches.
- Yes → **Runs on bench?**

Runs on bench?
- Yes → Locate short, binding, or swap case.
- No → **CPU swap work?**

CPU swap work?
- Yes → Bad CPU, watch voltage and heatsink on replacement.
- No → Motherboard bad.

Freezes on boot screen?
- Yes → **Freezes bare bones?**
- No → Proceed to Motherboard Performance chart.

Freezes bare bones?
- No → Proceed to conflict resolution chart
- Yes → **Freezes on swapped RAM?**

Freezes on swapped RAM?
- No → Replace RAM with type listed in motherboard documentation.
- Yes → **CMOS settings default?**

CMOS settings default?
- Yes → **Heatsink active?**
- No → Load defaults from BIOS.

Heatsink active?
- Yes → Runs on bench?
- No → Install new heatsink, connect fan. May be too late for CPU.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

Motherboard, RAM, CPU Failure

**Or copy and paste http://www.fonerbooks.com/cpu_ram.htm**

Motherboard, RAM, CPU Failure

Do you get a live screen? A message saying "No Video Signal" or anything similar doesn't count as a live screen in this case. You need to get at least as far as a BIOS screen, either the system BIOS or an adapter BIOS loading.
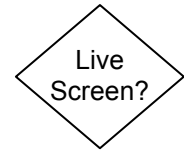
Does the system power up? Do you hear any beeps, drives spinning up, fans, etc. If the power isn't coming on, proceed to Power Supply Failure. If the power supply diagnostics sent you back here, follow through these diagnostics as a double-check before giving up on the motherboard.
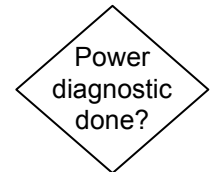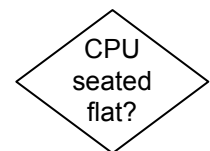
If you haven't performed the Video Failure diagnostics for a dead screen yet, do so now. Don't ignore the obvious steps, like checking the power cord and the outlet. If you skip the video diagnostics and continue with the motherboard flowchart, you could easily end up buying replacement parts for hardware that's not bad.

One of the most common failures following motherboard or RAM upgrades is improper insertion of memory modules. The levers should be lowered before inserting the memory module, and should raise themselves up and lock in place when the module is correctly seated. If you're using obsolete RIMM (Rambus Inline Memory Module) memory, the modules in a bank must be matched, and you must install CRIMMs (Continuity RIMMs) in the empty sockets. If you're using older SIMM (Single Inline Memory Modules), each bank needs a matched pair. In both cases, matched doesn't just mean capacity and speed, it also means manufacturer.
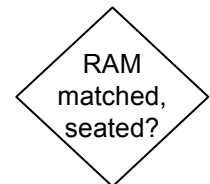
There are a number of reasons for a system with a good power supply to refuse to power up which were covered in the power supply diagnostics. Another reason is a failed CPU insertion, whether it's a slot or socket CPU. With good lighting, using a flashlight if necessary, make sure that any socket CPU is sitting dead flat in the socket, which means that the heatsink should be perfectly parallel to the motherboard surface; the CPU may be so totally hidden beneath some heatsinks that you can't see the edges. This problem should really only be relevant if you just upgraded your CPU or installed a new motherboard, because the CPU socket locks the CPU in firmly and the heatsink adds another level of clamping. If a socket CPU is a new install, you have to remove the heatsink and CPU to visually inspect it for damage such as crushed or bent legs. A CPU will not seat correctly if the socket locking arm wasn't raised all the way up before the CPU was inserted, or wasn't lowered all the way down after. If your CPU won't sit down in the socket properly, either the socket is faulty or you have the wrong CPU

Live Screen?

Power diagnostic done?

Video diagnostic done?

RAM matched, seated?

CPU seated flat?

Illustrated CPU replacement:

www.fonerbooks.com /r_cpu.htm

for the motherboard! I haven't seen a CPU creep out of a socket due to thermal shock for over a decade.

It's pretty tough to tell if old slot type CPUs are seated by visual inspection, so when in doubt, I reseat them. On the plus side, you can remove and reseat a slot CPU without removing the heatsink, since they form an integral unit. Make sure you correctly identify release levers on a slot CPU package, which are normally located at the top of the CPU package, to the inside of the motherboard support structure.

Fan on heatsink active?

A stone dead CPU is another reason for a system to fail. All modern CPUs require a heatsink, and most of these are an active heatsink, with a fan on top. You may encounter a heatsink without a fan in mass-manufactured brand-name systems where the manufacturer had the engineering talent in-house to do a thorough thermal analysis and determined that the airflow over a passive finned heatsink was enough to keep the CPU within the operating temperature range. When there is a fan on the heatsink, it must be hooked up to the correct power point on the motherboard for the BIOS to monitor its condition and turn it off and on. If you just installed a new CPU and powered the system up with no heatsink, it may have failed already. If the fan on your active heatsink isn't spinning up, replace it and hope for the best. Make sure you see the new heatsink fan operating since it could be the power point on the motherboard that's failed.

Hear beeps?

If you have a system that powers up, the next question is, do you hear any beeps coming from the motherboard speaker. If your motherboard doesn't have an integrated piezoelectric speaker but does have a speaker connection next to the power and reset connections (usually the front, left-hand corner of the motherboard) attach a case speaker. If you hear an unending string of beeps, it's often bad RAM, while a repeated sequence can be RAM or video. Other beep codes have been largely abandoned since they pertained to non-user replaceable surface mount components. Beeps or no beeps, I always reseat the video adapter and the RAM, paying special attention to the locking levers on the memory sockets.

Default motherboard settings?

Are your motherboard settings on the defaults? Whether you just put in a new motherboard or have been fooling around with overclocking, restore the default settings. This is often accomplished with a single jumper or switch setting, but sometimes it involves moving several jumpers or switches. Get the default values from the motherboard documentation. If you can't find the original manual or locate the equivalent documentation on the Internet, you may have to skip this procedure. Sometimes, the silk screens on the motherboard are

sufficiently detailed to work out the defaults, but you need really good eyes to figure it out.

Although we're repeating a little of the power supply diagnostics here, stripping down the system is the next step in a "no power-up" scenario. Unplug the power cord before each change in the case. Disconnect drives, one at a time, reconnecting power and trying power up after each. Next start removing adapters, saving the video adapter for last, reconnecting power and retrying after each change to ensure you discover which component is causing the failure.

Running the motherboard without a case is a common technique used by technicians to eliminate any weird grounding and shorting issues or mechanical stresses. It also makes it much easier to swap the CPU if that's required. I normally do my bench testing on top of a cardboard box, with a static free bag or foam between the bottom of the motherboard and the cardboard. You don't walk away from a test like this or you might come back to find the box on fire! If your motherboard powers up on the bench with the same power supply that you used in the case, you have a geometry problem. Ideally, you should have a spare power supply for bench testing if you're going to do regular repair and testing work.

Runs on bench?
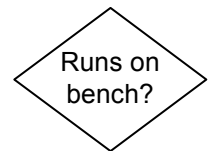
Make sure some standoffs aren't higher than others, putting unacceptable stress on the motherboard. Check that every standoff appears under a screw hole. The easiest way to be sure is to count the standoffs, count the screws, and make sure there are no screws leftover after you install the motherboard. There could be a short caused by a misplaced standoff, a loose screw, metal chips from shoddy materials. I've encountered standoff shorts that produce an endless string of beeps like RAM failure, without damaging the motherboard. There's also the possibility that the case geometry is so messed up (out of square or level when the cover is forced on) that it's putting an unacceptable mechanical stress on the motherboard resulting in an open circuit. If you can't find the cause of the problem, don't hesitate to try another case and power supply.

Illustrated motherboard installation:

www.fonerbooks.com /r_board.htm

If you still have a "no power" situation with the motherboard running out of the case, there's always the last refuge of a scoundrel. Swap in a known good CPU not forgetting to install a good heatsink and to connect the fan, even just for a quick test. I try to keep around some cheap old CPUs for this purpose, just in case the motherboard is a CPU eater. It's another good reason to leave all the motherboard settings on the default "Automatic" setting, so you don't have to fool around with them at this stage. If your old CPU is bad and the heatsink fan is dead, it's a pretty sure bet that the dead fan caused the CPU

CPU swap work?
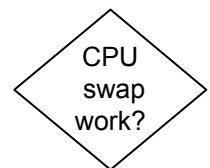
failure. If the heatsink fan is working, determining whether the CPU failure was due to poor heatsink contact, improper motherboard settings, or lousy power regulation from the motherboard is a guessing game. If the motherboard is an older make and you have a couple bucks to spare, replace the CPU and the motherboard together. Replacing just the CPU, even if the motherboard tests out OK, is kind of risky and usually tough to justify from a price/performance standpoint unless the system was practically new, say less than a half a year old.

Illustrated motherboard removal:

www.fonerbooks.com /r_mother.htm

If you still have a no power situation, not to mention no beeps and no video, you're probably looking at a bad motherboard. Again, this diagnosis assumes that you went through the Video Failure diagnostics, which would have forced you through the Power Supply Failure diagnostics as well. I still wouldn't be in a hurry to take a gun to the motherboard. Get your system operating with a replacement motherboard and all the identical parts that the old motherboard failed with before you make the trash can decision.

Freezes on boot screen?

Does the system power right up, give a happy beep or two, then freeze on the BIOS screen? This can occur on an all text screen, during or after memory count, while checking for drives, or the feared "Verifying DMI Data Pool." The problem is very likely due to a conflict, most like between the adapters but also possibly between incompatible drives sharing a bus.

Freezes bare bones?

Strip the system down to bare-bones, just a power supply, motherboard, minimum RAM, CPU and heatsink, and video adapter. If the system no longer freezes when it's stripped down, but complains about the lack of a boot device, proceed to Conflict Resolution.

Freezes on swapped RAM?

Try swapping the RAM around, reordering the banks if you have more than one bank of RAM installed, or moving the only module installed to a neighboring slot. If this doesn't cure the freeze-up, and you have some suitable known good RAM from another system, try it. If the RAM currently installed doesn't meet the motherboard manufacturer specs, you shouldn't be using it; even if it seemed to work until this point. Improperly selected RAM can be the cause of problems ranging from no-boot to intermittent lock-ups. Is the RAM seated correctly and in the proper quantities (i.e., number of modules, addition of continuity modules, or CRIMMs, if you are using RIMMs). Also make sure that the system didn't use tinned (silver color) contacts against gold contacts, or the dissimilar metals will cause corrosion over time due to a constant electrical current when the power is off. Replacing RAM at this point isn't a guaranteed proposition, but it's a good item to

eliminate. Don't toss out the RAM you remove because you may find out later that it's actually good.
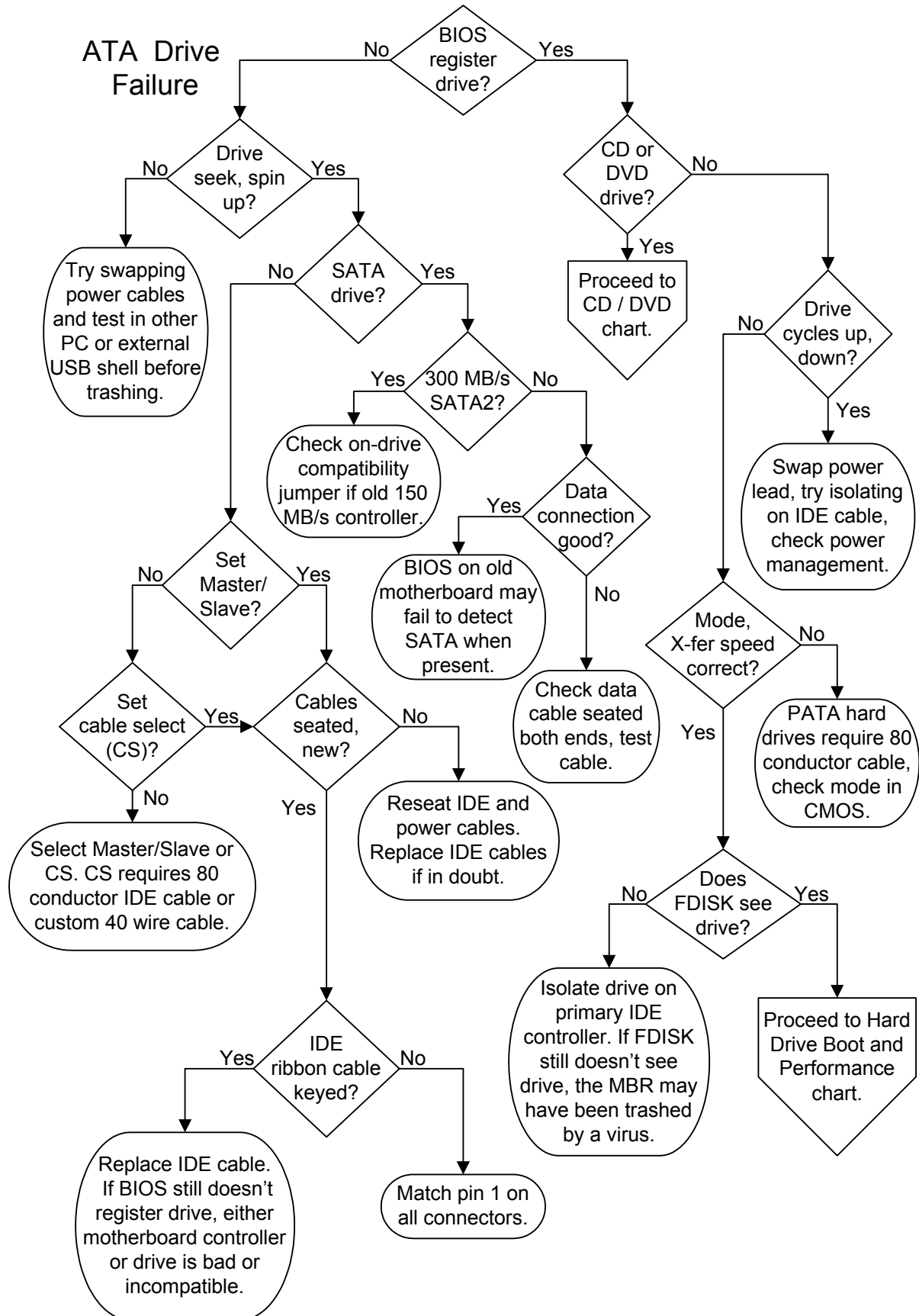
If you aren't using the default CMOS settings, try restoring them all at this point. You can usually restore these from a major CMOS menu item like "Restore Default Settings" or "BIOS Default Settings." The default settings usually put everything on autodetect and use the recommended timing for the RAM. This means if you're overclocking, stop it, at least until you get the system running again. It doesn't matter whether or not overclocking the exact same CPU or RAM in a friend's system worked without a hitch, you're exceeding the manufacturers recommendations so it's a gamble.

CMOS settings default?
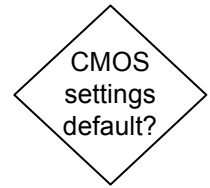
An overheating CPU will cause the system to quickly lock up. Remove the existing heatsink and fan, make sure that the fan is working properly AND that the geometry of the bottom of the heatsink will bring it in full contact with the exposed CPU die or the top of the CPU package. Apply an approved thermal grease or thermal tape before reinstalling the heatsink. Don't put on too much thermal grease or you'll just make a mess. The thermal media is only there to fill the microscopic gaps between the die surface and the heatsink. Don't improvise your thermal material, go to a computer or electronics store and buy some. Installing heatsinks can be frustrating, but this isn't a "bash away at it" process. You can damage the CPU if you start cracking the heatsink against it in an attempt to get the heasink to sit right. Be patient, study the mechanical connections, make sure you aren't hitting some poorly placed component on the motherboard and check that your heatsink isn't so oversized it just won't fit on the particular motherboard.

Make sure the fan on that heatsink spins up the second that power comes on. If it doesn't, despite being connected to the correct power point (see the motherboard manual), replace it with a new active heatsink unit. Make sure the bottom surface of the new unit will make full contact with the exposed CPU die or the top of the CPU package. The only problem with replacing an active heatsink is it may be too late for your CPU. CPUs have an unfortunate tendency to damage themselves when they overheat. Some CPUs can go into thermal runaway and destroy themselves in a matter of seconds without proper cooling.

ATA Drive Failure

BIOS register drive?

No → **Drive seek, spin up?**

Yes → **CD or DVD drive?**

- Drive seek, spin up?
  - No → Try swapping power cables and test in other PC or external USB shell before trashing.
  - Yes → **SATA drive?**
    - No → **Set Master/Slave?**
    - Yes → **300 MB/s SATA2?**
      - Yes → Check on-drive compatibility jumper if old 150 MB/s controller.
      - No → **Data connection good?**
        - Yes → BIOS on old motherboard may fail to detect SATA when present.
        - No → Check data cable seated both ends, test cable.

- CD or DVD drive?
  - Yes → Proceed to CD / DVD chart.
  - No → **Drive cycles up, down?**
    - No → (to Mode, X-fer speed correct?)
    - Yes → Swap power lead, try isolating on IDE cable, check power management.

Set Master/Slave?
- No → **Set cable select (CS)?**
- Yes → **Cables seated, new?**

Set cable select (CS)?
- Yes → Cables seated, new?
- No → Select Master/Slave or CS. CS requires 80 conductor IDE cable or custom 40 wire cable.

Cables seated, new?
- No → Reseat IDE and power cables. Replace IDE cables if in doubt.
- Yes → **IDE ribbon cable keyed?**

IDE ribbon cable keyed?
- Yes → Replace IDE cable. If BIOS still doesn't register drive, either motherboard controller or drive is bad or incompatible.
- No → Match pin 1 on all connectors.

Mode, X-fer speed correct?
- No → PATA hard drives require 80 conductor cable, check mode in CMOS.
- Yes → **Does FDISK see drive?**

Does FDISK see drive?
- No → Isolate drive on primary IDE controller. If FDISK still doesn't see drive, the MBR may have been trashed by a virus.
- Yes → Proceed to Hard Drive Boot and Performance chart.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

[ATA Drive Failure](http://www.fonerbooks.com/ide_hd.htm)

Or copy and paste http://www.fonerbooks.com/ide_hd.htm

ATA Drive Failure

Are all installed ATA drives properly identified by the BIOS and displayed on the start-up screen? Any modern PC should be able to identify the drive by model number, brand, capacity, and usually the transfer mode. Some brand name PCs may not display a start-up BIOS registration screen, so you'll have to enter CMOS Setup to view the information. If the key stroke required to enter CMOS Setup isn't displayed on the screen as the PC begins to boot, you'll need to look it up in the documentation or on the Internet. Common keys used to access CMOS Setup at boot are, <DEL>, <F1> and <F2>.

Does the hard drive spin up? We covered this in the power supply diagnostics, but I'll repeat it here for convenience. When the PC powers up, you should hear the hard drive motor spinning up the drive and the gentle clunking sound of the read/wrote head seeking. If I can't tell whether or not the drive is spinning up, even with my fingers on the drive's top cover, I run the drive in my hand. A spun up drive resists a slow twisting movement just like a gyroscope. Don't flip it quickly or play with it or you may damage the drive, not to mention touching the circuitry against a conductor and causing a short. Just power down, put the drive back in and continue with the diagnostics. If it's a SCSI drive, you're on the wrong diagnostics page, but maybe some new ATA hard drive will adopt the SCSI practice of a jumper to delay spin up. SCSI drives offer this option since you can install up to 15 on a single controller, and spinning them all up at once would cause the hardiest power supply to droop. Try swapping the power lead or running the drive on another power supply. One of the reasons I always use four screws in older PATA drives is so I can push hard on the power connector without the unit shifting around and possibly damaging the circuit board. I've never broken a power socket off the circuit board on a hard drive, but I've seen it done, so don't go too crazy on it. Try the hard drive in another PC or a USB shell before you conclude that it's dead.

The diagnostic tree splits here between the newer SATA (Serial ATA) drives and the older PATA (Parallel ATA) drives. PATA drives are often referred to as plain "ATA" or "IDE", the terms refer to the same technology. SATA and PATA drives feature different connectors for both for power and data, so you can't hook the wrong drive up to the wrong interface. On the SATA drives, the power cable is wider than the data cable, on the older PATA or IDE drives, the data cable is a wide ribbon cable and the power cable is an old fashioned Molex with red, yellow and black wires.

BIOS register drive?

Drive seek, spin up?

Illustrated PATA hard drive replacement:

www.fonerbooks.com /r_hard.htm

SATA drive?

300 MB/s SATA2?

The initial interface speed for SATA drives was 150 MB/s, also known as SATA 1. The newer 300 MB/s SATA 2 drives are now widely available, but replacing a SATA 1 hard drive with a SATA 2 hard drive on an older PC can get tricky. If the SATA 2 drive isn't recognized by the BIOS or won't boot reliably, check if the drive has an onboard compatibility jumper that will force it to work properly with the older 150 MB/s controller.
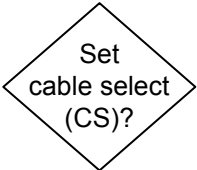
Data connection good?

SATA drives are pretty bullet-proof in comparison with the older IDE technology. If the drive powers up but isn't recognized by the BIOS, it's possible that the data cable is bad, or not properly seated on either the drive and the motherboard. If the data cable is known to be good (ie, it works in another system), try attaching it to a different SATA port on the motherboard. Some motherboards offer a completely separate set of SATA connectors for RAID arrays (see hard drive performance). If the drive manufacturer supplied software that works with the drive and the operating system loads, even though the BIOS doesn't recognize the drive, you can still use it.

Set Master/ Slave?

Any time two old IDE drives share a single cable, the computer needs a way to tell them apart. This can be accomplished by using jumpers on the drives to set one to "Master" and the other to "Slave" or through selection by the cable. The Master/Slave setting is fixed by a single jumper, usually on the back end of the drive between the power socket and the IDE connector. The labeling for the jumpers is usually in shorthand, "M" for Master and "S" for Slave. Some older drives include a jumper for "Single" (and spelled out labels) for when the drive is the only drive installed on the ribbon. Since pre-SATA motherboards always supported both a primary and a secondary IDE interface, it's not necessary with a two drive system to hang them both on the same cable. The boot hard drive should always be the Master on the primary IDE interface. If the CD, DVD, or any other IDE drive is to share the same cable, it should be set to Slave.

Set cable select (CS)?

Most new PATA drives support Cable Select (CS) which means the pin 28 connection in the cable will determine which drive is Master and which is Slave. The 80 wire ribbon cables that should come with all new motherboards and drives support cables select and have color coded connectors: Motherboard IDE Connector - Blue, Slave IDE connector (middle connector on cable) - Grey, Master - Black. Cable select is supported by custom 40 wire ribbon cable and older drives; these are usually found in brand-name systems. The jumpers on both drives should be set to cable select if you aren't setting one as Master and the other as Slave.

If the drives still don't register properly, make sure the power cable is seated in the drive's power socket, which can take a bit of force. The ribbon cable connectors must also be seated all the way into the IDE port on both the drives and the motherboard, or adapter card if you're are using a RAID adapter. The most common reason for a cabling failure of this sort is that the connection was partially dislodged when you were working in the case on something else. Try a new ribbon cable. While cable failures are rare, it can happen, and it's a favorite trick of investigative reporters writing articles about computer repair rip-offs to intentionally introduce a bad IDE cable into a PC, just to see how many parts a shop will sell them.
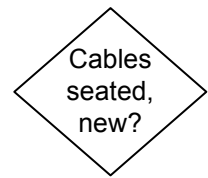
Are the ribbon cable connectors and the IDE ports on the drives and the motherboard keyed such that the cable can only go one way? Check the pin 1 location on all of the connectors and ports. On IDE drives, pin 1 is traditionally located next to the power cord, but it's not a 100% rule for all time. Motherboards can be pretty strange about cable ports. I've even remember an old one where the pin numbering on the floppy and IDE interfaces were oriented in opposite directions. The pin 1 location on the motherboard is normally marked with an arrow, a dot, a white square, anything to show one end of the interface as different from the other. If the motherboard won't register any drive you attach, even on new cables, and if those drives are spinning up, it indicates that either the IDE controller is bad or all the drives you've tried are bad. You can try running on the secondary IDE controller if you've only been working with the primary, but the next stop is installing an add-in IDE adapter or replacing the motherboard.
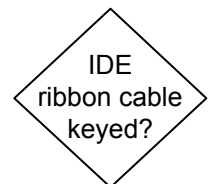
The troubleshooting procedures for ATA drives that aren't recognized by the BIOS are identical, whether they are hard drives, CDs, DVDs, tapes or any other ATA device. If the BIOS registers the installed ATA drives correctly and the drive you're having problems with is a CD or DVD, proceed to the CD or DVD Failure diagnostics.
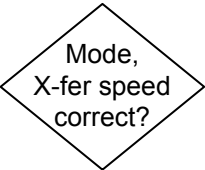
Does the drive cycle up and down? Try swapping the power lead for a spare or one used by another drive. For older IDE drives, try isolating the drive on its ribbon cable, even if it means temporarily doing without another drive for the sake of troubleshooting. If neither fix helps, try disconnecting the data cable to ensure that the drive isn't receiving some flaky power down signal from a bad ATA interface or crazy power management scheme. If it still cycles up and down, the drive is probably toast. Test the drive in another system or a USB shell before labeling it dead.

If you have an old drive that spins up but won't seek (you never hear the head move in and out), it's probably a mechanical failure. The last

ditch effort before giving up or sending it out for data recovery is tapping lightly with a screwdriver on the cover of the drive, away from the circular section where the disks are spinning. This might encourage a stuck head to get moving. Freezing the drive for a few hours in the freezer (use a sealed bag) may get you temporary access to a drive with failing electronics that overheat in a hurry. Just make sure you have your backup media prepared if you try any of these last ditch efforts, because it may work just the one time.

Does the drive make little clicking noises and fail to get going? Restart the machine, with the reset button if you have one, and hopefully it will boot. If not, try in a warmer room, or put the PC in direct sunlight to warm up and then try it again. It's far from guaranteed, but this is one of the few problems that can result from the drive being too cold rather than too hot. If you do get it started, run ScanDisk. It doesn't hurt to reseat all of the cables on the drive and the ribbon cable to the motherboard, since connections can also loosen up over time. However, if you can't get it going, it could be a legitimate drive failure. If you don't mind losing all of the data onboard, try FDISKing and reinstalling the operating system again.
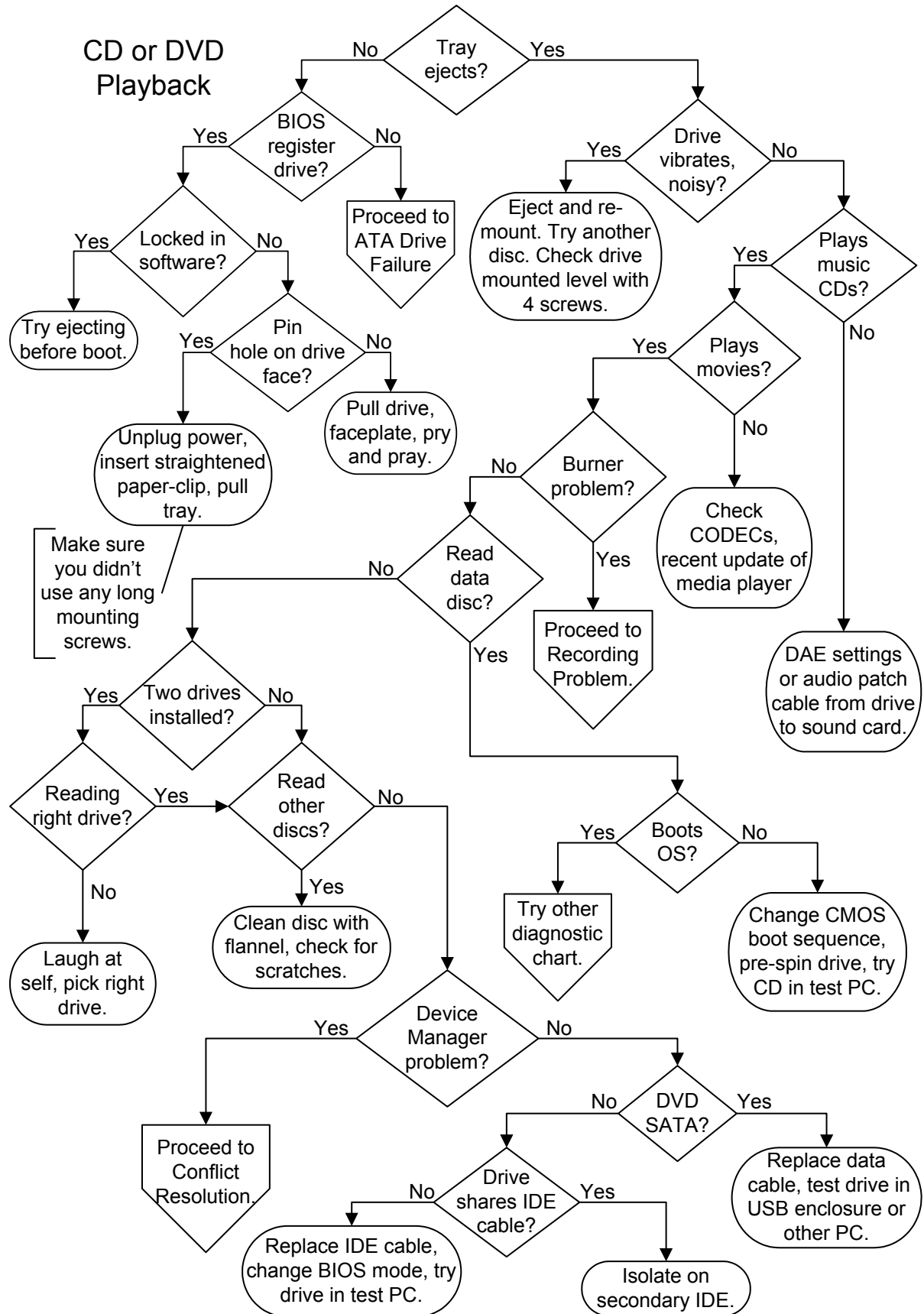
Mode,
X-fer speed
correct?

Does the BIOS report the transfer mode correctly for older PATA drives, ie, UDMA/100, ATA/66? UDMA must be enabled in CMOS, or set on "Auto," for high speed transfers. IDE hard drives after around 1995 require the 80 wire ribbon cable, at least for high speed operation. You can check CMOS Setup to see if there's a manual override to select the higher speed transfers, though the automatic settings should pick it up. Also try isolating the hard drive as the sole device on the primary controller. If you're adding a new hard drive to an older system, it's possible that the old motherboard and BIOS simply don't support the faster transfer, even with the new cable. I'd be leery of flashing the BIOS to try to get the speed up, even if the motherboard manufacturer supplies it.

Does
FDISK see
drive?

Can you install an operating system, or access the drive with any generation of FDISK to create or view partitions? Check again that the ribbon cable is fully and evenly seated and there aren't any "read only" jumpers set on the drive (normally only found on SCSI's). Try a new ribbon cable. If this doesn't do it, it sounds like either the drive's MBR is messed up, or there's a problem with the way the software is communicating with the BIOS, which really shouldn't happen. If you don't mind losing whatever info is on the drive, you can try FDISK/MBR and see if it helps.

CD or DVD Playback

Tray ejects?

No → BIOS register drive?
- **Yes** → Locked in software?
  - **Yes** → Try ejecting before boot.
  - **No** → Pin hole on drive face?
    - **Yes** → Unplug power, insert straightened paper-clip, pull tray.
      - Make sure you didn't use any long mounting screws.
    - **No** → Pull drive, faceplate, pry and pray.
- **No** → Proceed to ATA Drive Failure

Yes → Drive vibrates, noisy?
- **Yes** → Eject and re-mount. Try another disc. Check drive mounted level with 4 screws.
- **No** → Plays music CDs?
  - **Yes** → Plays movies?
    - **Yes** → Burner problem?
      - **No** → Read data disc?
      - **Yes** → Proceed to Recording Problem.
    - **No** → Check CODECs, recent update of media player
  - **No** → DAE settings or audio patch cable from drive to sound card.

Read data disc?
- **No** → Two drives installed?
  - **Yes** → Reading right drive?
    - **Yes** → Read other discs?
    - **No** → Laugh at self, pick right drive.
  - **No** → Read other discs?
    - **Yes** → Clean disc with flannel, check for scratches.
    - **No** → Device Manager problem?
- **Yes** → Boots OS?
  - **Yes** → Try other diagnostic chart.
  - **No** → Change CMOS boot sequence, pre-spin drive, try CD in test PC.

Device Manager problem?
- **Yes** → Proceed to Conflict Resolution.
- **No** → DVD SATA?
  - **No** → Drive shares IDE cable?
    - **No** → Replace IDE cable, change BIOS mode, try drive in test PC.
    - **Yes** → Isolate on secondary IDE.
  - **Yes** → Replace data cable, test drive in USB enclosure or other PC.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

CD or DVD Playback

Or copy and paste http://www.fonerbooks.com/ide_cd.htm

CD or DVD Playback

The most basic and potentially most disastrous problem that can occur with a CD or DVD drive is a stuck tray. Will the tray eject when you press the eject button? Press it once, like a doorbell, and then move your finger away, or you may be sending it repeated open and close commands. The drive won't pop right open if it is actively playing a disc, and the operating system may be able to override the stop and open command. If you're trying to eject a music CD or DVD using Media Player software (clicking on a software eject button on the screen) and it doesn't work, try the manual button on the drive. If this is a newly installed drive, make sure you used the short screws shipped with the drive and not longer screws which can jam the mechanism. If there's a disc in the drive that can no longer be read, make sure the power supply lead is still seated in the socket on the back of the drive.

Tray ejects?
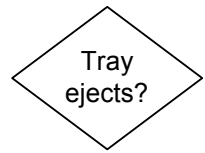
Shut down, restart, and try again. If the tray still doesn't eject, reboot again and note whether the BIOS registers the drive. Some brand name PCs don't report installed hardware on a boot screen, so you'll have to access CMOS Setup to check. If the BIOS doesn't registered the drive, it may have dropped dead. Proceed to ATA Drive Failure if the BIOS no longer registers the drive.

BIOS register drive?

Before you start tearing apart the machine, make sure that the tray isn't locked by software. The easiest way to check is to reboot the PC and hit the eject button before the operating system loads, but you can also check the properties under the drive icon in Windows "My Computer." If the drive LED shows that it's trying to read a disc, and the eject button doesn't interrupt the task, it won't be able to eject either. Some player software may lock the eject button in hardware, but you can eject using the software eject button on the player.

Locked in software?

Assuming the drive is still registered by the BIOS and operating system, you really do have a stuck disc. The next step is to look for a pinhole on the front of the CD or DVD drive. Power down the system and unplug the power cord, then straighten out a couple inches worth of paper clip, the heaviest gauge that will fit in the hole. Gently push the paper clip straight into the hole, until you feel it depress the release mechanism. This will sometime cause the tray to pop out a fraction of an inch, other times you will have to pry it a little to get it started. Once you have enough tray sticking out to grab it with your fingers, you should be able to pull it out. If the faceplate seems to be bulging as you pull, the disc is hung up on it, and the best thing to do is remove the drive from the PC and then remove the faceplate.

Pin hole on drive face?

Drive vibrates, noisy?
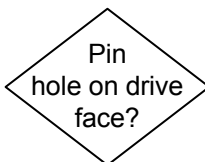
Does the drive cause the whole PC to tremble when it spins up? Is it noisy? Make sure that the drive, if internal, is mounted with four screws, and level. High speed drives will vibrate like crazy if a disc is off balance, usually because the disc itself has some weighting problem. Aside from obvious physical flaws (like the dog or the kid took a bite out of the edge of the disc) a miss-applied label can create an unbalanced disc. Try ejecting and reinserting the disc. I wouldn't keep running a drive that vibrates badly. It could end up damaging the discs (discs have been known to shatter at high speeds) and it doesn't do the other components in your system any good to be vibrated, which can lead to connections working apart or worse. If the problem only occurs with some discs, you can blame the discs. Otherwise, I'd look into a new drive.

Plays music CDs?

Can you listen to music CDs through your speakers? The following assumes that you can get operating system sounds to play from your speakers. If not, proceed to Sound Failure. First, make sure that the CD isn't muted in the software mixer panel. Next, if the drive is equipped with an audio jack on the front, stick in a cheap headphone (if you have one) and see if the CD is playing. In any case, if the CD is spinning and the time is advancing in whatever version of Media Player you have installed, the drive is actually playing the CD. Newer drives support DAE (Digital Audio Extraction) and some SATA drives don't support the old analog audio output at all. If you have a newer drive, check the DAE settings in the drive properties.

Illustrated drive replacement:

www.fonerbooks.com /r_cd.htm

Older drives, both SATA and PATA, required an analog patch cord inside the case. The audio patch cord from the drive to the sound card or the sound port on the motherboard may not be connected, or the device volume could be turned down in a software mixer panel. The easy check for incorrect audio patch cable (3 or 4 wires) connection without opening the PC is to try a multimedia disc, such as a game. Note also that in two drive systems, the builder may only have patched the audio output of one of the drives through to the sound card.

Plays movies?

If you can't play movies in your DVD that you can play on a television DVD player, the problem is usually with the software CODEC (Coder/DECoder). Test the movie on a TV first to make sure the disc is good. The media player you are using may display a specific error message, like telling you the screen properties must be set to a certain resolution and number of colors for a movie to play. Or, the player may report that it can't find a decoder (CODEC) to play the particular disc. Even if the movie worked last night, your media player may have received an automated update the next time you went online that rendered the installed CODEC obsolete. If you search the Internet, you'll find plenty of people trying to sell you CODECs, but if you use

Google and stay away from the advertisements, you should be able to get the updated version for free. You may also encounter new copy protection schemes that render some discs unplayable on your PC even though you aren't trying to copy them. The only solution for this again lays in software and Internet research for the specific failure. It may turn out that the only way to render your DVD player compatible with a new type of copy protection is to update the DVD drive firmware. If an update isn't available for your particular model, you can end up out of luck when it comes to playing certain discs from certain studios after a particular date.

Does your problem involve recording CDs or DVDs? If so, proceed to CD/DVD Recording Problems. For a problem booting a factory CD in a recorder, stay here. It's become increasingly difficult to tell factory pressed CDs from recorded CDs, due to the highly polished labels that can be easily printed for recorded CDs and DVDs. Factory produced discs are usually silver on the read surface, while recorded discs are often gold or green.

Burner problem?
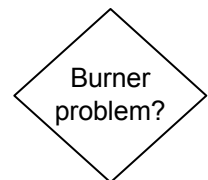
Does the drive read discs? When you mount a disc, be it software or music, does the drive acknowledge that a disc is present and let you view the contents? It doesn't matter (at this point) whether or not you can get through installing the software on the disc or read all of the information. The question is simply, can the drive see anything at all on the disc?

Reads data discs?

Does your system refuse to boot known good boot CDs, like operating systems from Windows 98 on up? Try setting the boot sequence in CMOS Setup to boot to the CD or DVD first. This shouldn't really be necessary if the hard drive is uninitiated, but I've seen it fix the problem. I've also seen some high speed drives which take too long to spin up and report to the BIOS that there's a bootable disc present. Sometimes you can get around this by opening and closing the tray, which should cause the drive to spin up, and hitting reset right after you've done so. With any luck, you'll get the timing right so that the BIOS checks for a bootable CD while the drive is still active.

Boots OS?

Do you have CD and DVD drives installed? It's easy enough to mix up drives on a PC, and a CD drive isn't going to going to have much luck reading a DVD. A CD recorder along with a DVD player was a common two drive combination years ago, but the DVD may not be able to read CDs recorded just two inches away. See Recording Problems if you're having trouble reading a recorded disc. Some older systems have both a CD ROM (reader) and a CDR (recorder).

Two drives installed?

Reading right drive?
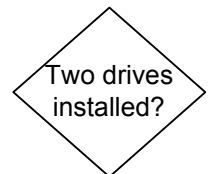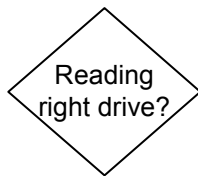
Are you reading the right drive? If you have two physical drives, make sure the operating system is actually looking at the drive the CD or DVD has been placed in. Trust me, I've been fooled myself into opening up a machine by blind belief in the wrong drive letter. Most drives have an activity LED that tells you when the drive is active. Make sure the activity LED is lighting up on the drive you put the disc in when you try to read it.
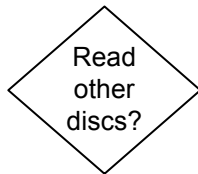
Read other discs?

Does the drive read other discs? Try another disc, a factory CD in CD ROMs or CDRs or a factory DVD in DVD ROMs or DVDRs. If it works, the problem is with the media and not the drive. Make sure the disc you can't read is the right type for the drive your are trying it in, ie, CD, DVD, CDR, DVDR, noting that many of the recordable discs won't be readable in other players. Clean the disc with a soft bit of flannel. The discs are plastics, so don't use solvents. Scratches can render a disc unreadable, including scratches on the surface (label), which cause distortions in the layer that is actually being read from the bottom. Try the disc in another reader before chucking it out, it could just have trouble with the device you were trying it in.

Device Manager problem?
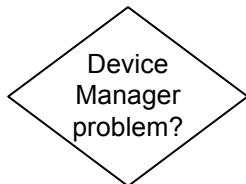
Does the drive show up in the operating system, on your desktop or in Device Manager in Windows operating systems? If not, the first step is to reinstall the driver. Get the latest driver from the manufacturer's website and install it. If you can boot an OS CD in the drive, but the drive has disappeared from Device Manager, try reinstalling the OS. Check if there's a firmware update for the drive itself, though flashing a drive, just like flashing a motherboard BIOS, should be a last resort. Even though the BIOS registers the drive's presence, you can still try swapping the ribbon cable. The laser lens in the drive could be incredibly dirty, so if you can find an inexpensive cleaning kit, it's worth a try.
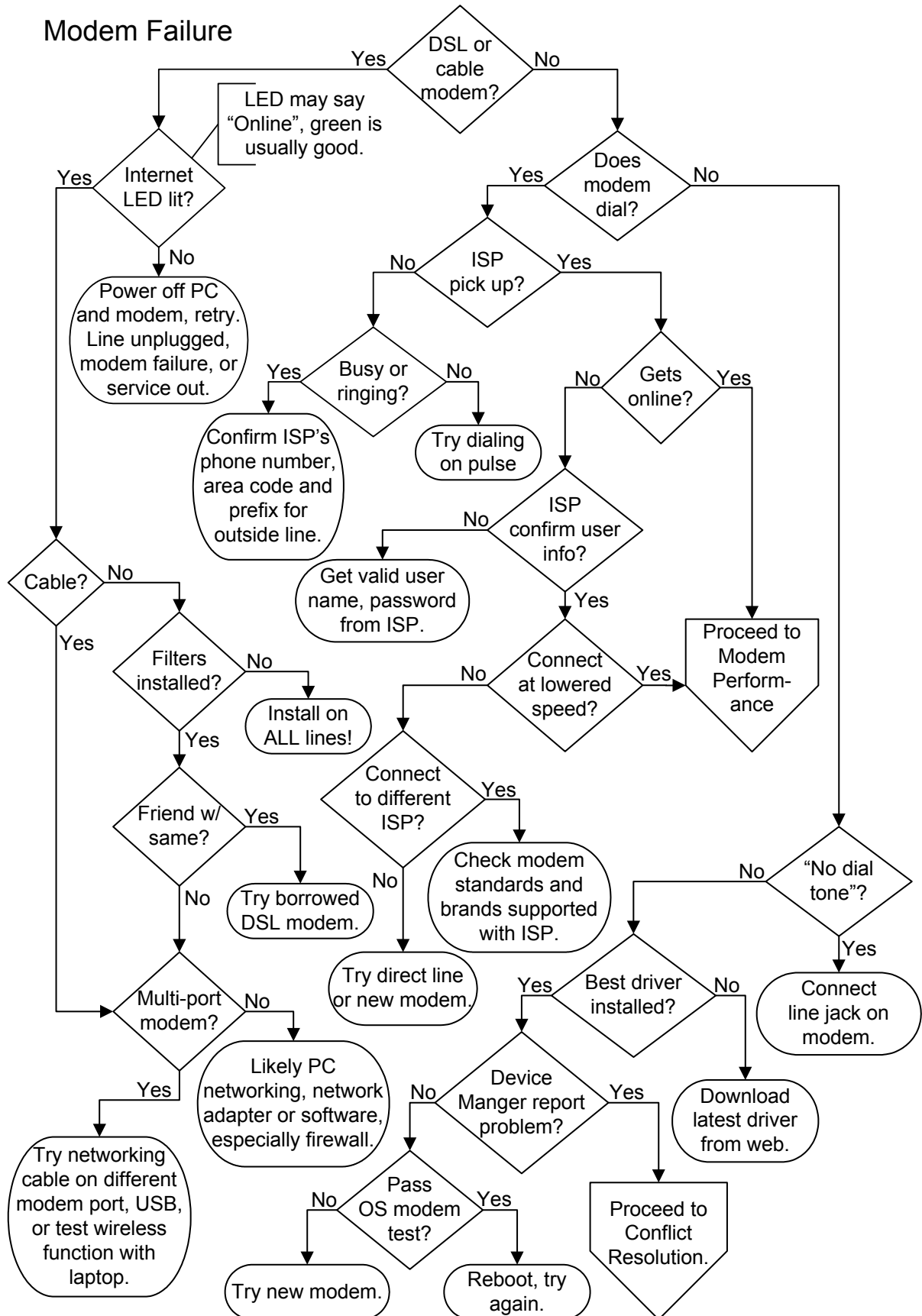
DVD SATA?

If you're using a newer SATA DVD recorder/player, there aren't any jumpers to set or cable sharing issues. If it's a new build, make sure that you don't have the data cable attached to a dedicated SATA RAID controller. But the safest way to determine if there's a problem with your SATA cable, or a compatibility issue with the BIOS, is to try the drive in another PC, or mount it in an external USB shell and connect it externally.

Drive shares IDE cable?
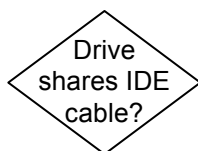
You could have a simple cabling problem or Master/Slave conflict. If the drive is the Slave on primary IDE controller with the hard drive, move it to the secondary IDE controller as the Master (requires another IDE ribbon cable). If you already have another device installed as the secondary Master, try the drive as the secondary Slave or temporarily replace the Master for the sake of seeing if it works.

Modem Failure

DSL or cable modem?

Yes → Internet LED lit?

LED may say "Online", green is usually good.

Internet LED lit?
- Yes → Cable?
- No → Power off PC and modem, retry. Line unplugged, modem failure, or service out.

Does modem dial?
- Yes → ISP pick up?
- No → "No dial tone"?

ISP pick up?
- No → Busy or ringing?
- Yes → Gets online?

Busy or ringing?
- Yes → Confirm ISP's phone number, area code and prefix for outside line.
- No → Try dialing on pulse

Gets online?
- No → ISP confirm user info?
- Yes → Proceed to Modem Performance

ISP confirm user info?
- No → Get valid user name, password from ISP.
- Yes → Connect at lowered speed?

Connect at lowered speed?
- No → Connect to different ISP?
- Yes → Proceed to Modem Performance

Cable?
- No → Filters installed?
- Yes → Multi-port modem?

Filters installed?
- No → Install on ALL lines!
- Yes → Friend w/ same?

Friend w/ same?
- Yes → Try borrowed DSL modem.
- No → Multi-port modem?

Connect to different ISP?
- Yes → Check modem standards and brands supported with ISP.
- No → Try direct line or new modem.

Multi-port modem?
- No → Likely PC networking, network adapter or software, especially firewall.
- Yes → Try networking cable on different modem port, USB, or test wireless function with laptop.

"No dial tone"?
- No → Best driver installed?
- Yes → Connect line jack on modem.

Best driver installed?
- Yes → Device Manger report problem?
- No → Download latest driver from web.

Device Manger report problem?
- No → Pass OS modem test?
- Yes → Proceed to Conflict Resolution.

Pass OS modem test?
- No → Try new modem.
- Yes → Reboot, try again.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

Modem Failure

Or copy and paste http://www.fonerbooks.com/modem.htm

Modem Failure

Do you have a high speed Internet connection using the phone line for DSL (Digital Subscriber Line) or through the cable TV network? The vast majority of high speed connections are accomplished through an external modem or modem/router, which provides for both the high speed connection to the Internet and supports connections to multiple PCs. Newer DSL modems almost always include a wireless router to support laptops, the cable companies are running a little behind, so a separate wireless router may be required.
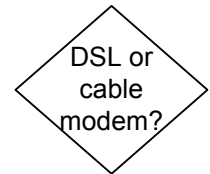
Does your modem actually dial the phone? If you have a desktop PC, there should be a little piezoelectric speaker on the modem itself. Many people (and computer vendors) turn down the volume for this in software, which you can find on the "Properties" tab of the modems in Windows Control Panel. Notebook computers will normally run the sound through the notebook speakers, which means the volume controls in Windows and the volume dial built into the notebook body must both be turned up.
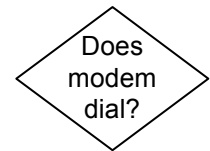
Does the ISP answer? You should be able to hear the ISP's modem pick up and whistle and hiss back at your modem through the speaker. If not, make sure you are dialing the right phone number and that the ISP isn't temporarily down. Just dial the number from a regular phone handset and the ISP modem should pick up and whistle at you.

Make sure you have the area code and any prefix for an outside line correct, especially if you are dialing from a business. Dial-up lines in a business must have a clean path through a business phone system (PBX - Private Branch eXchange), just like fax lines. If the phone is always busy, call the ISP's tech support or try one of the other phone numbers they provide. It could simply be that they don't have enough modems available for the traffic in your area at certain times of day.

If you hear the modem dial but the dial tone remains until an operator picks up and tells you that your phone is off hook, you're trying to use "tone" dialing on a "pulse" system. This is easily changed in the "Dialing Properties" of the basic modem page in Control Panel.

Do you get an error stating that the ISP can't negotiate a connection, protocol, anything along those lines? Unfortunately, this error is too generic to help much with troubleshooting. Even messages telling you to check your password can be caused by just about anything. Try redialing several times without changing anything to make sure you aren't just encountering an overloaded modem pool.

ISP confirm user info?

Illustrated modem replacement:

www.fonerbooks.com /r_modem.htm

Call your ISP on the phone to confirm your login information if it's the first time you're dialing in. Re-enter your password, remembering that caps usually count. Assuming you have your username and password right, the odds are any errors reported aren't due to any protocol settings on your part, especially if you haven't changed the defaults. If the error crops up at random, it's usually due to the weather and the time of day, as both play a major role in the circuit conditions of the telco infrastructure. Stormy or damp weather can badly degrade the lines of older telephone networks. The time of day is also important, with the beginning of the business day, and a period in the mid-afternoon usually being the worst times. I've actually run non-Internet modem applications on dedicated lines that showed a huge increase of line noise during these periods, whatever your telco tells you.

Connect at lowered speed?
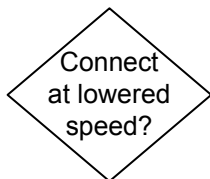
Will your modem connect at a lower speed? You can change the maximum speed the modem will try to connect at in Control Panel, but I've noted that the settings don't always take effect, even after rebooting. You can search on the Internet for the modem control string to force your modem to V.34 compatibility, then insert it in the Advanced Settings for the modem which can be accessed through the Modem Properties in Control Panel or Device Manager. If you succeed in connecting at a lower speed, try going through the Modem Performance diagnostics.

Connect to different ISP?
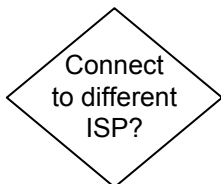
Can you connect to a different ISP? The best test for eliminating modem failure is to see if it will connect to a different service. If you can connect to a friend's ISP, it's a definite proof that the modem isn't bad. It doesn't mean that the ISP you can't connect to is at fault, it could be a question of matching modem standards. By the same token, if you can't connect to another ISP, it doesn't prove your modem is faulty, it could still be a problem with line conditions.

No dial tone?

If the software reports, "No Dial Tone", make sure you have the patch cord from the modem to the wall jack plugged into the "line" jack of the modem. The "phone" jack on the modem is for plugging in a regular telephone to use when you aren't online. If the wall jack is live, try changing the telephone patch cord running from the "line" jack on the modem to the jack on the wall. Check the phone jack at the wall with a telephone handset. If it doesn't work you need to repair the in-wall wiring or try a different jack.

Best driver installed?

Have you installed the most recent driver you can find on the modem manufacturer's web site? If your modem is integrated on the motherboard, it would be an update to your motherboard driver. Even if your modem is brand-new, hardware often ships with obsolete drivers, either because it's been sitting on the shelf somewhere for a

year, or because a recent operating system release has overtaken it and a better driver is available.

Does the operating system report the modem as present and operating? This information appears in Device Manager in Windows. If not, reinstall the driver for the modem. If an IRQ conflict is reported in Device Manager, resolve it by either changing IRQ in software (with a plug-n-play modem) or changing the IRQ jumper on the modem for an old card. If you absolutely can't get around it, you may have an extremely unfriendly sound card or other adapter on the bus which is hogging the IRQ the modem is capable of dealing with. Note that a modem can share an IRQ with a serial port in some cases, though it can't be used when a device is actually attached to that port. If you can't resolve the Device Manager problem, either you have a hardware conflict, or the modem is bad. Proceed to the Conflict Resolution chart.

Does the operating system or dialing software report the port is "in use" when you try to dial? In Windows Control Panel > Modems, go to "Diagnostics," select your modem, and click on "More Info". Try shutting down and rebooting. The "port in use" error is due to another active software application claiming the port the modem is set on. You could get this error if you're already using the modem but don't realize it for some reason, but it's more likely that you've recently installed software for synchronizing a palm device or for a camera that's colliding with the modem driver.
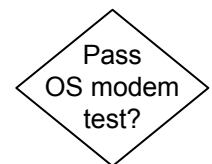
High speed modems, whether DSL or cable, come equipped with a number of status LEDs that report on the condition of the modem. The LED we are interested in here is the one that reports on the status of the Internet connection to the modem. When the modem is powered on, this is the last LED to display a steady state status. Most DSL modems and some cable modems also feature an LED that simply reports whether or not the modem sees a live connection to the cable company or to the phone company. When the Internet LED is off or red, make sure the cable or DSL line is connected, turn off the modem and the PC and try restarting just the modem, giving it a few minutes to negotiate the connection. The problem might be that service in your area is out, but check the obvious before calling the provider.
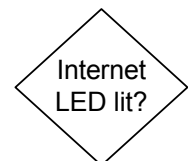
Do you have a cable modem? Cable modems are somewhat simpler to troubleshoot, so the flowchart skips a few steps here that aren't applicable to cable modems. One of the steps we skip is simply swapping your modem with that of a friend or neighbor. While it might work in some cases, cable companies are far more finicky about installed hardware than phone companies due to their fear of people

Device Manger report problem?

Pass OS modem test?

Internet LED lit?
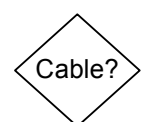
Cable?

pirating cable signals, so it's not a positive test. If you are having drop-out problems with a cable modem, it makes sense to simplify the modem's connection to the cable interface in your home, especially if you are using and coaxial switch boxes.

Filters installed?

DSL modems are shipped from the Internet provider with a number of filters that you are supposed to install on every other phone connection on the circuit that's in use. Not installing the filters leads to two problems. First, you'll hear constant static on the regular phones when you try to talk, which should be enough of a reason to install them. But some digital phone devices, such as answering machines or faxes, may also interfere with the DSL modem's ability to negotiate an Internet connection unless the filters are installed. Consult the instructions that come with the filters if you aren't sure where to use them. If you are setting up a DSL modem for the first time and can't get an Internet connection (assuming the phone company assures you it's live), you can also try unplugging any other phone devices in the house to make sure they aren't causing a problem.

Friend w/ same?
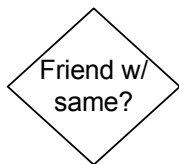
One easy way to test if your DSL modem has failed on most systems is to borrow the identical working DSL modem from a friend or neighbor using the same system. Likewise, if your friends are brave, you can try installing your DSL modem on their line and seeing if it works, which eliminates the possibility that the modem is good and your incoming phone line has problems.
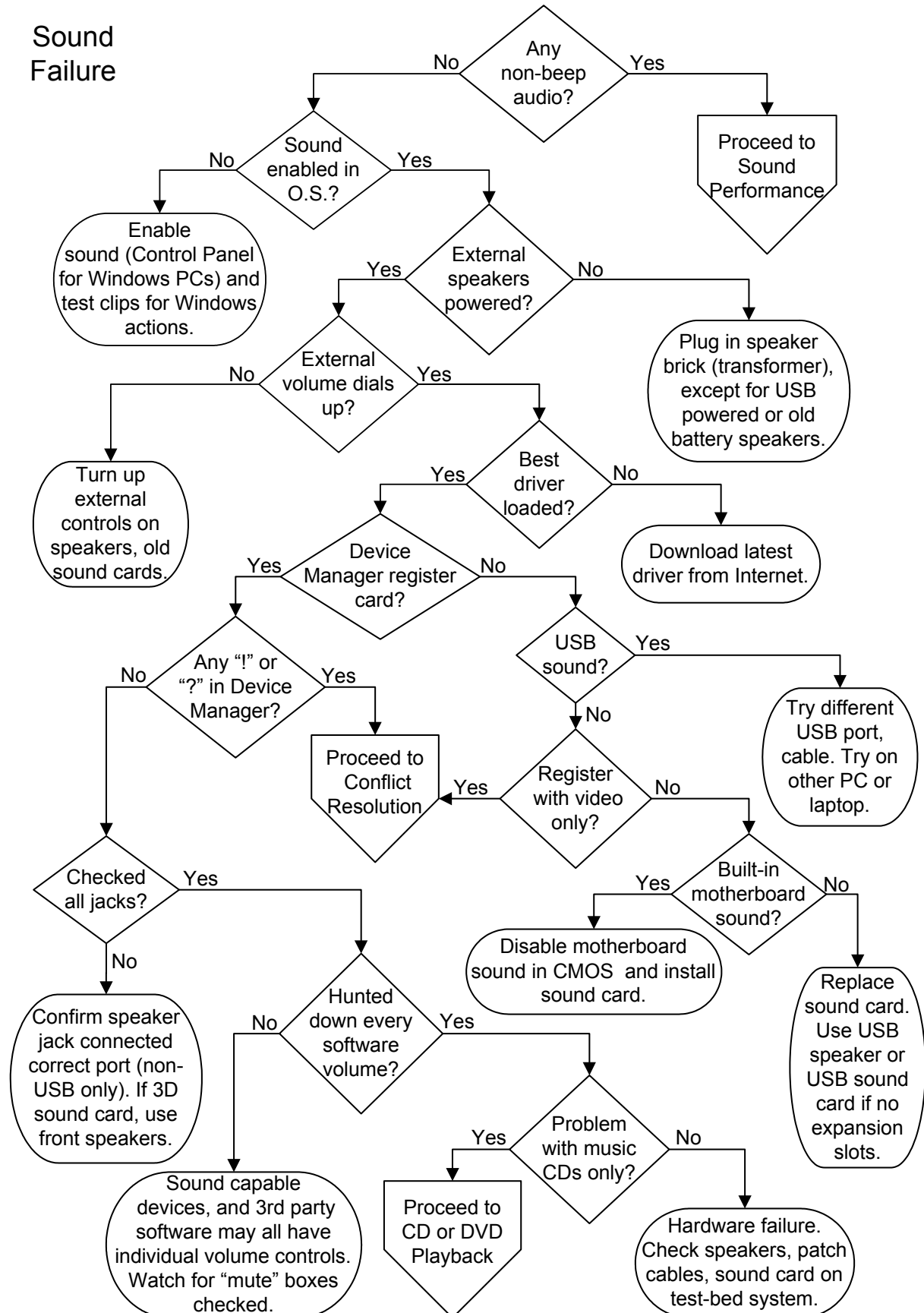
Multi-port modem?
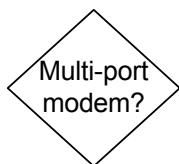
If your modem only supports a single networking connection and USB, but you can't get online with your PC, try changing to the other connection and reinstalling the software supplied by the service provider. Replace the networking or USB cable with a known good cable. If you have a true modem/router, try connecting the networking cable from your PC to a different port, even if the status LED indicated the other port connection was good. If the router supports wireless, borrow a laptop and see if you can get online, and then turn off wireless and connect the laptop directly to eliminate the possibility that you have a failed network adapter or bad USB port in the PC.

If the hardware all tests good through the laptop or through your taking it to a friend's to test, but your PC network adapter or USB port are also working, the problem is software settings. Uninstall the software from the Internet provider and then try reinstalling, making sure you follow their instructions to the letter about the sequence of steps. Make sure your virus suite and firewall software aren't blocking Internet access and contact the tech support for your Internet provider who can walk you through all of the settings in Windows.

Sound Failure

Any non-beep audio?
- No →
- Yes → **Proceed to Sound Performance**

Sound enabled in O.S.?
- No → Enable sound (Control Panel for Windows PCs) and test clips for Windows actions.
- Yes →

External speakers powered?
- Yes →
- No → Plug in speaker brick (transformer), except for USB powered or old battery speakers.

External volume dials up?
- No → Turn up external controls on speakers, old sound cards.
- Yes →

Best driver loaded?
- Yes →
- No → Download latest driver from Internet.

Device Manager register card?
- Yes →
- No →

USB sound?
- Yes → Try different USB port, cable. Try on other PC or laptop.
- No →

Any "!" or "?" in Device Manager?
- No →
- Yes → **Proceed to Conflict Resolution**

Register with video only?
- Yes → **Proceed to Conflict Resolution**
- No →

Built-in motherboard sound?
- Yes → Disable motherboard sound in CMOS and install sound card.
- No → Replace sound card. Use USB speaker or USB sound card if no expansion slots.

Checked all jacks?
- Yes →
- No → Confirm speaker jack connected correct port (non-USB only). If 3D sound card, use front speakers.

Hunted down every software volume?
- No → Sound capable devices, and 3rd party software may all have individual volume controls. Watch for "mute" boxes checked.
- Yes →

Problem with music CDs only?
- Yes → **Proceed to CD or DVD Playback**
- No → Hardware failure. Check speakers, patch cables, sound card on test-bed system.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

Sound Failure

**Or copy and paste**
http://www.fonerbooks.com/sound.htm

Sound Failure

Do you get any audio out of the PC other than beeps on power-up?
The beeps you hear on power-up are not part of the PC's sound
system, they are generated by a tiny piezoelectric speaker on the
motherboard that is included strictly for diagnostic codes. If you are
getting any other audio from the PC, music, chimes, etc, the sound
hardware hasn't failed, so you can proceed to the sound performance
flowchart.

Is sound enabled in the operating system? In Windows, the basic
"Sounds" menu is found in Control Panel. Sound events that have little
speakers next to them are enabled. Enable sounds for some actions that
you recognize (like "exit program" or "minimize") and see if your
speakers work now. Note that operating system sounds don't need to
be enabled for music CDs or games to work, but if you're here, we're
starting off with the assumption that you aren't getting any sound out
of the speakers at all.
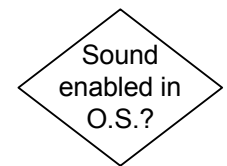
Are the speakers plugged in to a power source? The volume control on
speakers usually serves as an on/off as well. There are some super
cheap speakers that don't offer amplification, in which case there won't
be any power cord, but don't expect much in terms of volume or
quality. Really ancient speakers may be powered by batteries rather
than a transformer, so if your speakers don't have a power cord, double
check that they don't have a hatch for batteries.
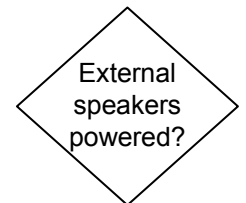
The oldest sound cards have a manual volume dial, as do most external
speakers. Manual volume dials should be adjusted to somewhere in the
middle of the range, not all the way to one extreme or the other. Did
you check? Check again. You don't want to invite a friend over to help
with your sound problem, only to find the volume is manually turned
down.
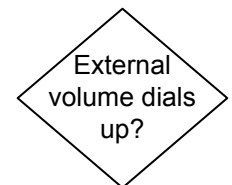
Have you loaded the best driver for the sound card? The best driver
means the most recent driver, so check the manufacturer's website for
an update, because your sound card may have been sitting on a shelf
for a year before you bought it. If the sound is integrated on the
motherboard, check for an update at your motherboard manufacturer's
web site.
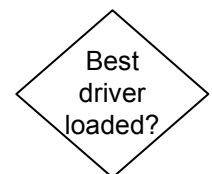
Does Device Manager register the sound card or integrated
motherboard audio and report that the device is working properly?
Even if you don't have the proper driver, Device Manager will
probably identify it as a sound controller. Before you start stripping

down the system or chase off to conflict resolution, make sure the adapter is seated in the motherboard slot.

Any "!" or "?" in Device Manager?

If the Device Manager reports a resource conflict between any of the audio devices and another device, look through all of your device reports and figure out where the conflict is. It may be resolvable by changing the settings in Device Manager, or it may take aggressive reshuffling of adapters. If you get a "!," "?" or "i" on the sound controller in Device Manager, proceed to Conflict Resolution.

Checked all jacks?

Check your documentation or the symbols on the sound card to make sure you actually have the speakers plugged into the proper jack. On high-end sound cards with front and rear speaker jacks, try the front speaker jack first. Check that your audio patch cables are all plugged firmly into the proper jacks and that the cables aren't damaged. If you have USB speakers, they don't jack directly into the sound card.

Hunted down every software volume?

Software volume controls are the #1 problem with sound, and a real pain to figure out if multiple people use the system. Aside from the primary volume control often found in your system tray, there are various other mixer panels and volume adjustments that get installed with the driver and are offered in various applications. All of these can cause a complete absence of sound if the "mute" box is checked. I don't have any magic method for finding the mixer panel or any additional volume controls in a typical system. The Multimedia icon in Control Panel is a good place to start.

Problem with music CDs only?

Does your sound system work properly with everything except music CDs? If so, proceed to CD and DVD Playback diagnostics. One good test is to try the speakers and cables on another system, or another device with a speaker jack, like a portable radio. Make sure you first turn the speaker volume control all the way down in case the output is already amplified. If your speakers and cables don't work anywhere, try swapping the cables to find out which is faulty. If the speakers and cables are good, either the sound card is blown or you didn't look hard enough for a hidden mute in software.

USB sound?

If you are using USB speakers or a full USB sound card, try connecting them to a different USB port. USB ports often break inside the PC when the cords are jerked or tripped over. If you can't get the USB sound device to function on the PC, test it on any other PC or laptop. If it works on another computer, you know that the problem is either that all of your USB ports have failed, which would usually mean the USB controller on the motherboard popped, that the driver software is incompatible, or that you didn't find a "mute" in the OS.

If Device Manager only registers the sound card when you strip out all the adapters except the video card, it's definitely a conflict. If it's a new build or a new sound card, make sure you followed the installation instructions, which may have specified that you must install the software before installing the hardware. If that was the case and you did it backwards, remove the sound card, uninstall the software through Windows Control Panel > Add/Remove Programs, and start over. If you have another sound card lying around, it's a good time to try it; otherwise proceed to Conflict Resolution.

If your only audio support is built into the motherboard, make sure it's enabled in CMOS Setup. If you are using a sound card, make sure any motherboard audio is disabled in CMOS Setup. The easiest way to replace a motherboard integrated sound card is to pick up USB speakers (the sound card is built into the speakers) or a full USB sound hub. The only potential problem with these is if you have an older CD or DVD drive that doesn't support DAE (Digital Audio Extraction). Without DAE, USB sound devices won't be able to play music CDs.
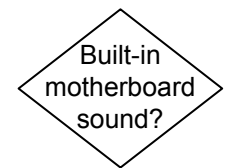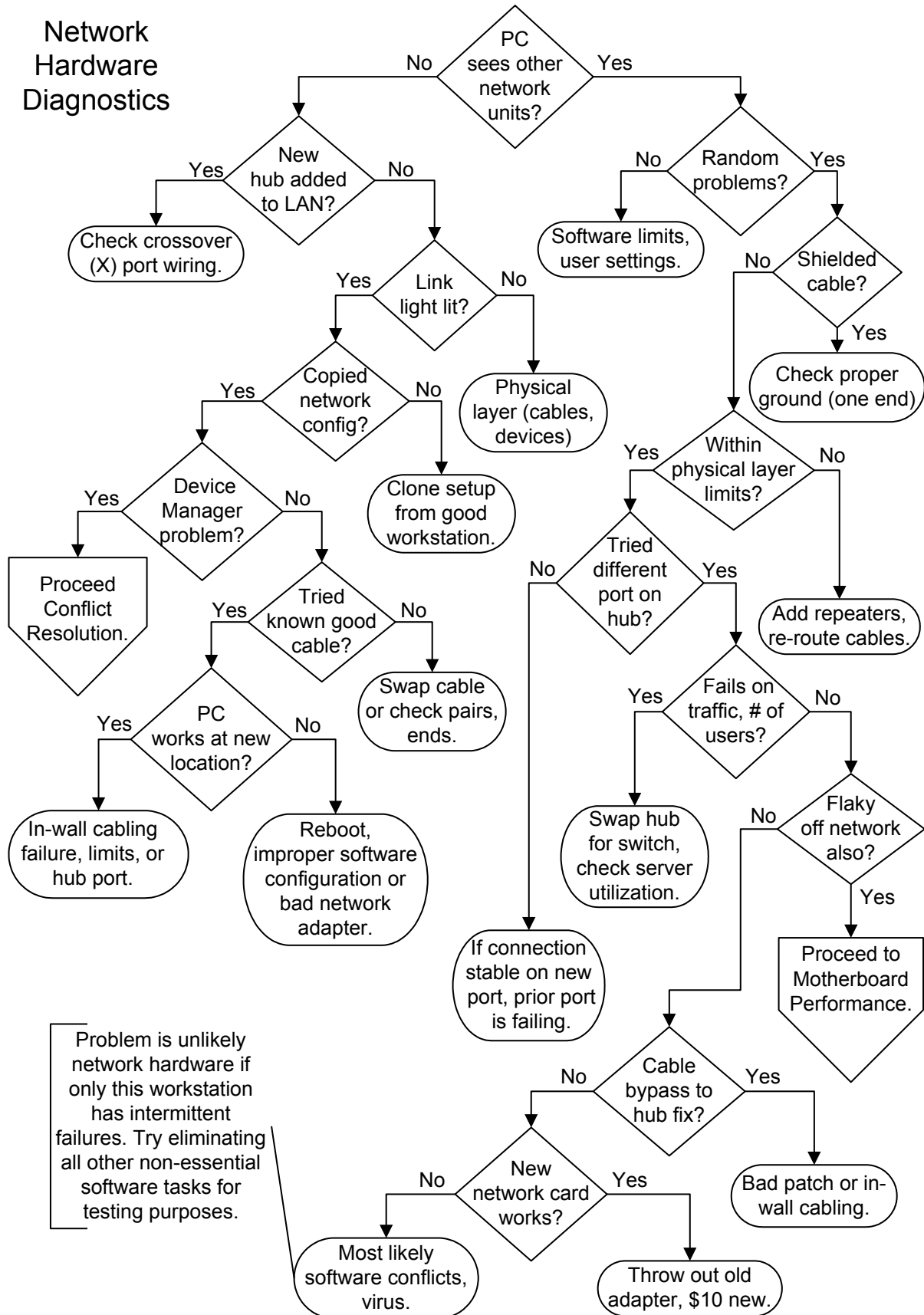
If you can't get the operating system to recognize an installed sound card, which is sure to be plug-and-play, shut down and unplug, remove all the other adapters except the video card from the system, reboot and let the BIOS and operating system adjust. Then shut down and unplug again, add the sound card, and see if you can get it going. If this works, you might still have problems when you add the other adapters back in, but if you do it one at a time, at least you'll find out for sure where the conflict lies.

Register with video only?

Built-in motherboard sound?

Illustrated sound card replacement

www.fonerbooks.com/r_sound.htm

Network Hardware Diagnostics

PC sees other network units?

No → New hub added to LAN?

Yes → Check crossover (X) port wiring.

No → Link light lit?

Yes → Copied network config?

No → Physical layer (cables, devices)

Yes → Device Manager problem?

No → Clone setup from good workstation.

Yes → Proceed Conflict Resolution.

No → Tried known good cable?

Yes → PC works at new location?

No → Swap cable or check pairs, ends.

Yes → In-wall cabling failure, limits, or hub port.

No → Reboot, improper software configuration or bad network adapter.

Yes → Random problems?

No → Software limits, user settings.

Yes → Shielded cable?

No → Within physical layer limits?

Yes → Check proper ground (one end)

Yes → Tried different port on hub?

No → If connection stable on new port, prior port is failing.

Yes → Fails on traffic, # of users?

No → Add repeaters, re-route cables.

Yes → Swap hub for switch, check server utilization.

No → Flaky off network also?

No → Cable bypass to hub fix?

Yes → Proceed to Motherboard Performance.

No → New network card works?

Yes → Bad patch or in-wall cabling.

No → Most likely software conflicts, virus.

Yes → Throw out old adapter, $10 new.

Problem is unlikely network hardware if only this workstation has intermittent failures. Try eliminating all other non-essential software tasks for testing purposes.

You can open the interactive version of this flowchart in your browser on the fonerbooks.com website by clicking on the chapter heading below. The interactive version allows you to get the text for each decision symbol without paging ahead.

## Network Hardware Diagnostics

Or copy and paste http://www.fonerbooks.com/network.htm

Network Hardware Diagnostics

Does the PC (Workstation) see any network resources, servers, other workstations? Note that some versions of networking software display "remembered" resources, even when the PC can't access them, so you'll need to actually click on a given resource to see if it's really available.
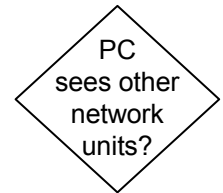
Have you recently added a network hub? Is the workstation the first workstation on a new hub, being stacked or chained to existing hub(s)? When connecting hubs or switches with twisted pair (RJ-45 connector) cabling, whether 10BaseT , 100BaseT or Gigabyte (1000BaseT), make sure that you either connect to an "X" port (uplink port), or use a special crossover cable. A crossover cable, unlike a straight through cable, connects pins 1 and 2 on one end to 3 and 6 on the other end and vice versa for 10BaseT and 100BaseT, and also connects pins 4 and 5 with 7 and 8 on the other end and vice versa for 1000BaseT. When building crossover cables, you must use a twisted pair for each named pair for noise protection. If you do have an X or uplink port, you normally see that it is connected to an adjacent port by a line or other symbol. You can only use one or the other, since they are using the same physical circuitry, with the X port making the pair reversal. Hubs have a power transformer that needs to be plugged into a live outlet.

Most network adapters have one or more onboard LEDs right next to the RJ-45 port to show the status of the link and network activity (traffic). Green is good for a link, a blinking LED next to it indicates traffic, or if they conserved on LEDs, the link LED will blink. No link light indicates there's a break in your physical layer. Check the physical connectors at all points on your network in the failed path, and make sure that you are within all of the limits for your physical layer in terms of number of workstations and distances. Swap the laptop's networking cable to another port on the router or hub and see if it works.

Have you cloned the software configuration from another workstation on the network (everything but the unique portion of the IP address, assuming you're set up for TCP/IP)? It's too easy to make a mistake with which protocol should be the default or with the spelling of a Workgroup, etc. At an active workstation, go through every option in the network setup and print screen every page and sub page that comes up. Keep it around for future reference when you run into networking problems with a similar workstation. If this is the first workstation on the network, or the second on a peer-to-peer, go with the defaults and make use of the operating system's built in troubleshooter, at least in Windows versions. Your problem is most likely software

PC sees other network units?

New hub added to LAN?

Link light lit?

Copied network config?
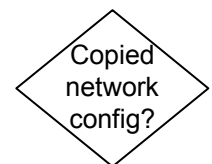
configuration, which is far too in depth to address in the chart. When in doubt, reboot.

Device Manager problem?

Does the Device Manager see the network adapter and report no conflicts? Try reinstalling the driver and rebooting. In Windows, start by deleting the existing network device in Device Manager. If Windows still won't recognize the network adapter, it could be a conflict with another hardware adapter or it could be faulty. If the adapter is built-in, either on the motherboard or in a notebook, try restoring the defaults in CMOS Setup. Proceed to the Conflict Resolution flowchart.

Tried known good cable?

Tried known good cable? Even if the link light is lit, it doesn't mean your cable is capable of carrying network traffic. An incredible number of techs make these cables wrong out of sheer laziness or ignorance. Don't say, "But it's a new cable!" Four conductors are actually used for normal implementations 10BaseT and 100BaseT, and the wiring is straight through, 1-1, 2-2, 3-3, 6-6. Pins 1 and 2 and pins 3 and 6 must each use a twisted pair, or the longer runs will fail and shorter runs will act unpredictably. Gigabit, or 1000BaseT cables, use all 4 pairs, with 4-4, 5-5 adding one pair and 7-7, 8-8 adding the other. In addition, visually inspect connectors to make sure they are solid and wired properly (shared pairs listed above). Squint into the transparent connector and try to take note of the color coding for each pin. Then go look at the other end of the cable and make sure that the color coding is the same, AND that a pair (i.e, blue, blue stripe) is used for the pair 1 and 2, 3 and 6, etc.

PC works at new location?

Take the PC (just the system box which some people call the CPU) to another workstation location and swap it out with that PC. If you get right on the network, that tells you that the physical link to the location where it failed is bad. That could be the patch cable, the in-wall wiring, or the port on the hub it connects to. If it doesn't work at the new location, that tells you it's either the network adapter or the software configuration. If it's an add-in adapter and you have a spare, by all means try swapping it out, but the software settings are more often the culprit. Make sure the driver is up-to-date and the correct version for the OS, make sure that you have cloned all the settings (except the machine name or final IP address) from a working machine, and try going through the OS troubleshooting steps.

Are your network access problems of a random or intermittent nature? Check for loose connectors. It's very easy to install a RJ-45 connector improperly or fail to crimp it tightly enough to hold to the cable such that it loosens up with just a minor physical movement. The problem might also be interference somewhere in the cable run. Make sure it's not draped over the back of a CRT or running directly over florescent lights or other noisy RF emitters. You could be experiencing software conflicts with other processes on the PC. You can try eliminating all tasks except the minimal network configuration and do some large file movements to see if the hardware layer is solid. More likely it's simply the loading of the network, a traffic jam, or you're exceeding the number of simultaneous users supported by the hardware (including wireless) or the software.
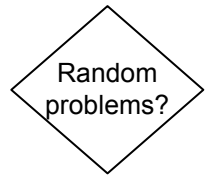
Are you using Shielded Twisted Pair (STP) or any other cable type with a non-signaling shield? Note that this is not the usual case for twisted pair cabling. Make sure that the shield is grounded at one end only, or you could end up with a ground loop and a constant leakage current. If it's not grounded at either end, it may act as an antenna to pick up and disperse interference. Also, make sure that your cables, even when grounded, are intelligently routed. Stay away from transformers, high current junctions, heavy equipment that can induce lots of electrical noise, though it's primarily the higher frequencies you need to worry about.
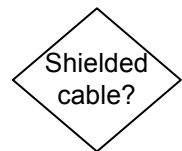
Are you within the physical layer limits for your network? This applies to both wired and wireless networks. Don't go by the number in the IEEE standard, use the limit in the hub, switch or base station documentation. Be aware that the distance limitations are based on a normal operating environment with the proper cabling or antennas installed. If your cables are made wrong, routed poorly, or are low quality, the limits will be reduced. Rerouting cables, adding repeaters (amplifiers) or eliminating sources of interference can increase the reach of your network.
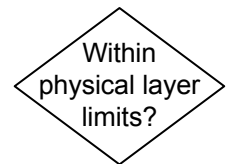
Have you tried a different port on the hub? There's no rule that says hubs have to fail all at once, and even though a performance degradation of a single port is a rarity, it's worth trying. It could also be that the cable end plugged into the hub wasn't crimped on as tightly as it could have been, causing the performance of the link to be dependent on the exact position of the cable, an unacceptable situation.
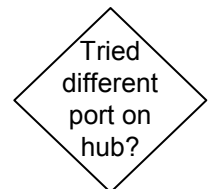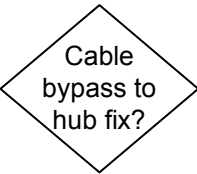
Fails on traffic, # of users?

Does the problem, be it lost connections, slow performance or anything else, occur during periods when network traffic is high or a large number of users are logged on? There are many reasons a network can bog down or have trouble in high traffic or high user count situations, including the natural limitations of the technologies being used. In general, if you are using a passive hub, you can greatly increase your network performance during high traffic periods by swapping the hub for an active switch. Also, if you are running a hybrid LAN, with a mix of 10BaseT and 100BaseT and 1000BaseT adapters, you should think about upgrading them all to 1000BaseT, providing the cable plant is all Cat 5, which it better be!

Flaky off network also?

Is the PC flaky when it's not on the network? If so, don't waste any more time on network diagnostics, proceed to Motherboard, CPU and RAM failure and look for the symptoms the PC is displaying. This isn't a good test of software problems, since you run different applications and have different resource usage when you're connected to the network.

Cable bypass to hub fix?

You should always have a proven long bypass cable for testing, that you can run directly from the workstation to the hub without going through walls, ceilings, etc. Make sure you are within the distance limits for twisted pair, wireless and IR, and within the total number of active stations limit for wireless and IR. Check for physical cable damage. The sheathing on the Cat 5 cables is thin and the inner conductors can be easily broken if the cable is stretched or crimped.

New network card works?

Does a new network adapter fix the problem? New PCI network adapters cost less than $10, so there's no reason not to try one. If you're running a wireless network with notebooks and add on wireless adapters, borrow one from a good unit. If the new network adapter hasn't fixed the problem and you've gone through all the physical layer diagnostics to get here, it's a software issue.

Your First Sale

Book Excerpt from "Start Your Own Computer Business"

You've sold your first PC to your mother's friend Doris, and then find out that whether you order it assembled or in pieces, there's not going to be any profit because you included Windows in the price but forgot to add in the cost. This drives you to ignore the top two tiers of distribution and go straight to the small importers with the aggressive pricing. You know the stuff is good because it says so on the fax. By using PriceWatch.com and going with the most aggressive pricing for each part, you figure you can scrape out a fifty dollar profit. You order an ATX case, keyboard and mouse from one place; a motherboard, CPU, RAM, hard drive and OEM Windows from a second place; and a floppy drive, video adapter, CD-ROM, modem, monitor and soundcard from a third place. Even the guy on the other coast promises you'll have the stuff within a week.

The next day, the ATX case and power supply show up with the keyboard and mouse, and the UPS gal wants a check for $80. "What's this?" you say. "The parts cost was $71." The UPS gal explains that the shipping cost was $5 and the COD tag allowing you to pay with company check cost $4. You pay and go back to your spreadsheet to see where this is heading. Three days later, the motherboard, CPU, hard drive and Windows show up from the middle of the country by Fed-X. You feel pretty good until you look at the invoice, which shows your credit card was billed for $355. Wait a minute, the parts total was $321. The bottom of the invoice shows a $29 item for 2nd day shipping, and another $5 for handling and insurance. You call the supplier, who reminds you that you wanted it by Thursday, and that he did tell you he was waiting for a shipment of RAM to arrive Tuesday morning. Well, at least you can give yourself credit that you bought the motherboard, CPU and RAM from a single vendor. Doing otherwise before your really know your vendors is pretty risky.

After assembling the parts that have arrived, you settle in to wait for the package from the other coast. It shows up after a week with a COD tag for exactly what you thought you were paying! Great! You pay, unpack the stuff to finish building your first PC and find the modem is missing. You read the invoice and see that the modem was "backordered" and the COD amount didn't include it. You run to the phone and call the vendor, who tells you, "Don't worry, it went out three days ago." "Call me next time before you backorder something on me," you yell at the voice. After you hang up, the voice says "Jerk." Three days later, the $29 modem shows up with a COD tag for $38. Hey, he did have to handle it separately, and the $4 for the COD is a

constant. It's not the modem you ordered, but at this point, Doris is calling every day (she pre-paid), so you swallow a total of $81 ($9 + $34 + $29 +$9) in shipping, handling and insurance costs. You begin to see where ordering everything from one nearby vendor, preferably with net terms (non-COD) or a credit card, makes more sense than parting the thing out all over creation.

You put all the paperwork in a file folder labeled "Doris" and file it. This is really a critical step. Nobody will take defective stuff back without paperwork, unless you have a real good relationship and can get the salesman to look it up on their computer system for you. You finish putting the PC together, load Windows, and everything is great. You load all the driver CDs for the video, modem, and sound card (you forgot to include speakers in the price), and Windows now takes twice as long to boot. Par for the course. The monitor gives off an odor like burning plastic on an ocean breeze, but you figure that will clear up. You run ScanDisk a couple times, wonder what a 24 hour burn-in really means, and if you should spend a hundred dollars on some testing software. Unless you have money to burn, don't bother. Just leave the thing turned on overnight and check that it still works in the morning. It's a decent test, and you're doing a lot more than most guys I've known.

You put the PC in the car, and drive it to the customer's home. If you were a mail-order business you could leave it on the doorstep, ring the doorbell and run, but you aren't. You take the PC out of the box and plug everything together. Your customer turns it on, the Microsoft flag appears, so you leave your homemade business card and go home relieved that you only lost around $31 selling your first PC. You use a hobby knife to cut up the boxes that Doris didn't want and you put them out for recycling day. The foam peanuts you save, believing that eventually they'll come in handy- good luck. The next morning the phone rings, your first tech support call. Doris bought an inkjet printer at Staples (they had it cheaper than any price you could find) and it doesn't work - Staples tells her it sounds like a computer problem. You warn your mother's dearest and oldest friend that if it's not a computer problem, you'll have to charge her your $50 field service rate, and she agrees. You arrive at her house, and immediately see that she's trying to use old typewriter paper in the printer and the paper isn't heavy enough for the feeder, producing all sorts of jams and "printer not ready or not connected" errors. Since you only spend two minutes in the house and it's such a silly problem, you can't bring yourself to charge her.

Being the clever sort, you cut a deal with your local Internet Service Provider (ISP) where they promise to pay you $100 at the end of the

year for each new customer you deliver to them. You call your customer, talk her out of going with AOL or Compuserve, which her son in Dallas has told her to get, and you drive out and create a dial-up-networking connection to her new ISP. You set her up with Internet Explorer and Outlook Express, spend two or three hours teaching her how to use e-mail and buy junk on E-Bay. Then you go home satisfied that you're now making the $35 to $50 an hour you always knew you were worth, even if you won't get it for twelve months.

Unfortunately, when her son visits for Christmas, he convinces her that she can save big bucks by signing a multi-year deal with a national provider, and your $100 miraculously vanishes. Adding insult to injury, the day after New Year's she calls you to say the modem isn't working anymore. On hearing that she has moved to AOL, you spend a half-hour on the phone angrily explaining that it's probably a software problem, and that you'll have to charge that elusive $50 field rate if you come out. She agrees, and you show up to find that the modem really did die.

You go home, pull out the "Doris" folder, call the vendor, who gives you an RMA (Return Merchandise Authorization) number and tells you he'll ship a replacement. You breathe a sigh of relief that the vendor is still in business, since you haven't talked to him in three months, and then send off the modem. After a week, you call, and he explains that he has to ship it back to his supplier, but they turn stuff around really fast, and you should have the replacement within two weeks. You give up and call your local importer and buy another $29 modem, paying with a credit card. It comes the next day and you install it. Doris is pretty upset at having been offline for a week, and suggests that maybe you've bitten off more than you can chew in "your little computer business." Two months later, her original modem arrives in a beat up package from some place you never heard of with a note saying they tested it fully and it worked for them. You put it in your own PC to test it and immediately smell smoke. Welcome to the PC business.

Excerpted from "Start Your Own Computer Business: Building a Successful PC Repair Business by Supporting Customers and Managing Money." by Morris Rosenthal, ISBN: 0-9723801-0-8

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