

# Ensuring PC Data Integrity

©2016 Bob McMicken – Forensic-Photography.Com

*If you keep your computer long enough, it isn't a question of if your hard drive will fail, only when. An uninterruptable power supply with effective surge protection will protect your computer and your data.*

If you're an evidence photographer, data integrity starts with your camera and memory cards. Use a DSLR, Canon or Nikon, with dual card slots for in-camera redundancy. Use premium memory cards such as Lexar Professional or SanDisk Extreme Pro. After two years, relegate cards to backup status. Discard cards that start acting flaky. Always format cards in the camera in which they'll be used. *Never format or reuse a memory card until you've uploaded your photos to your computer and run a full set of backups.* With that out of the way...

Hard drives and cooling fans are the only components in a computer with moving parts subject to wear and eventual failure. I started working with Data General mini-computers used in proprietary ADT alarm systems and Digital Equipment Corporation word processors in 1977, five years before the IBM PC was introduced. In the years since, I've seen my fair share of hard drive failures.

Hard drives usually fail without warning. One minute you're good, the next minute you're dead in the water.

This is not to say that other components can't fail but a hard drive failure can compromise the integrity of all the data stored therein, from a single file that can possibly be recovered to wiping out the entire operating system and all of your data and applications programs.

If your mother board smokes, a technician can install your hard drive in another computer and salvage your data even if you failed to make regular backups. *If your hard drive fails, you're dependent on your external backups.*

If you're a laptop user on the go, you can transmit and receive emails and text documents via Wi-Fi. I'm not sure that Wi-Fi is a viable option if you've just shot two hundred 24 megapixel JPEGs. A portable Seagate Backup Plus or a Western Digital Passport is good insurance until you can connect with your primary desktop or a network server. A 32 GB flash drive will do in a pinch.

If you can't find what you want locally, you'll find a good selection of flash drives, hard disk drives and solid state drives at [B&H Photo-Video](#), the same place that many photographers buy their cameras and lenses.

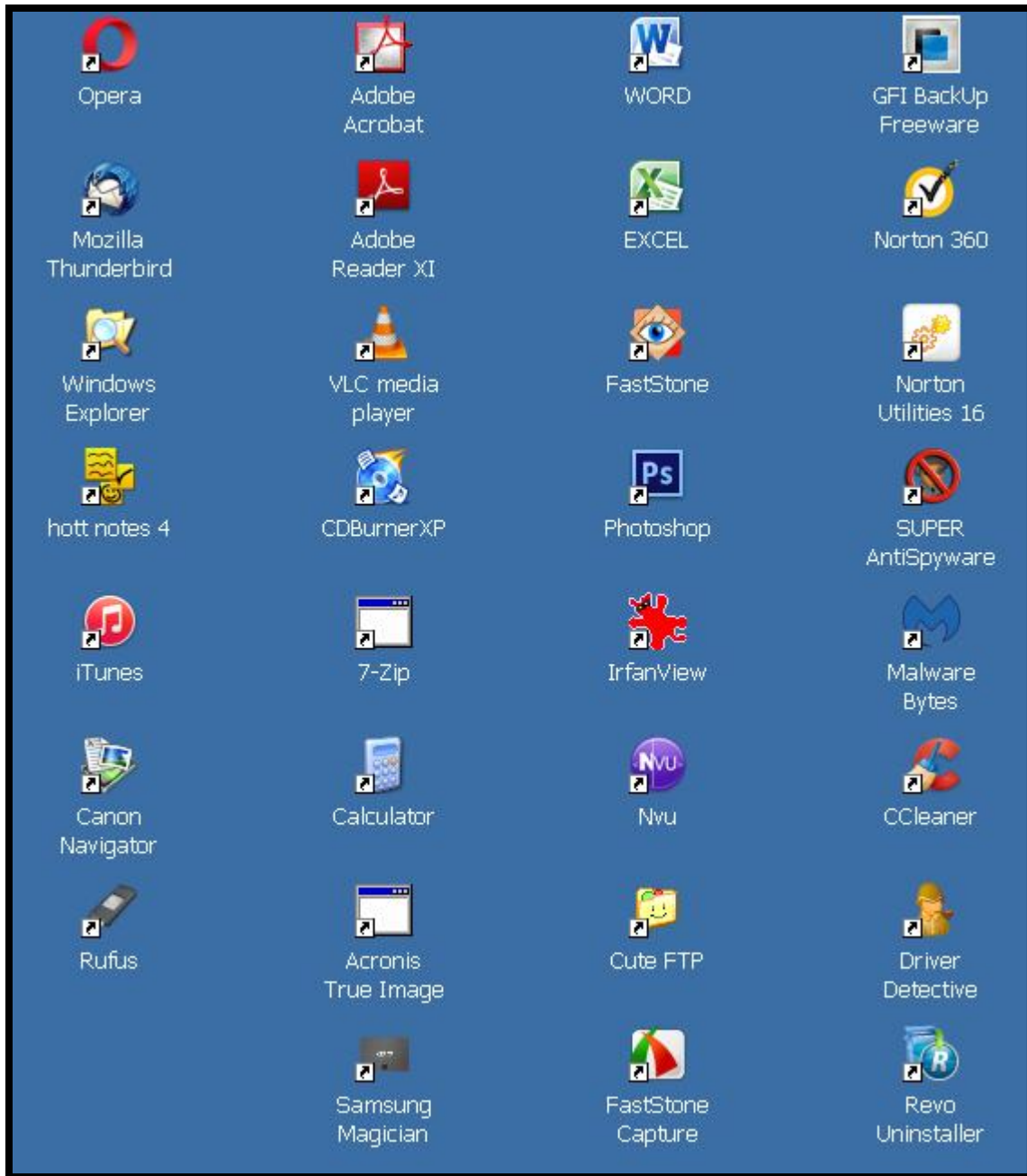
**Caveat:** **Flash drives are not suitable for long term storage. The same goes for unused hard drives. Active hard drives supported by a well-designed backup system are the most secure form of data storage, followed by [MAM-A Gold CDs](#) or a premium grade of acid-free paper stored in a UL-rated fire resistant data storage vault designed to keep the internal temperature below 125° in the event of a fire. This was another lesson learned the hard way.**

If you're working at a desktop computer in a mid- to large-size company, department or institution, you're undoubtedly connected to a professionally managed network supported by information technology (IT) professionals. Your data resides on a network server or on a cluster of servers, aka server farm.

Professionally managed data centers use RAID technology, sophisticated tape backup systems and Cloud storage to ensure that a catastrophic failure won't wipe out the whole shooting match or any component thereof. The people working in enterprise-level data centers tend to wear white lab coats and speak a language comprehensible only to Microsoft-certified system engineers and their acolytes.

Should the hard drive in a network-attached desktop go south, a technician can install a new hard drive and use disk-cloning software to install the operating system and standard application programs in an hour or two, once the box hits the bench. Hard drives are fairly standardized and relatively inexpensive.

An individual working at home or out of a small office has a problem if his or her computer is the repository of data that cannot easily be replaced or recreated. Even if you have your operating system, your application programs and your registration keys, reinstalling everything from scratch on a new hard drive and restoring your preferred defaults can take anywhere from several hours to several days.



I went through this exercise when the CD writer in my Windows XP desktop purchased in 2009 went south. Since I had to crack the box to replace the CD writer, I figured that it was prudent to replace the original hard drive which was seven years old, two years longer than the expected service life of a good hard drive such as a Seagate Barracuda or a Western Digital Caviar.

The original hard drive was a 350 GB Western Digital Caviar Blue which hosted the application programs shown in the screen shot that you see here. The

drive came with a two year warranty and exceeded every reasonable expectation. I boxed it up in case I might need to use it again at some future date.

I replaced it with a 250 GB Samsung Evo 850 solid state (SSD) boot drive and a 500 GB Western Digital Caviar Black hard disk (HDD) data drive, both with a five year warranty. I spent an extra twenty bucks on the Caviar Black to get the longer warranty and enough disk capacity to store several full-system backups without crowding.

*You never want to run a hard drive at more than 70% of its formatted capacity.* You need unused disk space for the drive to perform internal housekeeping operations and allow efficient disk defragmentation. You do defrag your hard drives on occasion, don't you?

*Replacing the HDD boot drive with a faster SSD boot drive reduced the time required for a cold boot from three minutes to thirty seconds,* with a corresponding reduction in the time required to load application programs and scroll through hundreds of photos to find the one that I was looking for. *I got my two hundred bucks worth.*

This project should have been a no-brainer because I was running Acronis disk-imaging software that, in theory, should have allowed me to transfer my operating system, my application programs and all of my data from the old drive to the new drive with a few keystrokes.

*Unfortunately, the computer failed to recognize Acronis bootable media on a thumb drive created when I purchased Acronis in 2010.*

*Fortunately, I subscribe to the [3-2-1 Rule](http://dpbestflow.org) defined by [dpbestflow.org](http://dpbestflow.org). In a nutshell, keep three copies of your data, a primary and two backup copies with the backup copies stored on different media and one copy stored off site.*

Thus, I had every byte of the 8,852 files in my 42 GB My Documents folder archived on two external hard drives plus in Norton Secure Storage on the Internet, aka The Cloud.

With the addition of an internal data drive, I now have three local backup drives (one internal and two external) plus a fourth on the Cloud. The internal drive is faster than the external drives and it goes with the computer if I have to put

it in the shop. My data is as secure as I know how to make it on a stand-alone desktop computer.

However, I was concerned about the failure of the disk-imaging software purchased in 2010. Rather than reinstall the old version, I downloaded the trial version of several disk imaging programs and found that Acronis True Image 2016 was the only one that could create a bootable flash drive that actually worked on a Windows XP machine.

A little digital detective work revealed that the bootable flash drive that I created in 2010 was, for whatever reason, corrupt. I couldn't see the boot file in Windows Explorer. I couldn't reformat the drive using the format command in Windows Explorer or from the DOS prompt.

I immediately used the free [Rufus 2.8](#) utility to reformat my remaining flash drives while checking for bad sectors. I downloaded Rufus to create DOS boot drives but found that it's a dandy way to test flash drives. All of my flash drives with the exception of the Acronis boot disk from 2010 passed without a problem.

Having seen the error of my ways, I purchased a three user license for the 2016 edition of Acronis True Image and proceeded to Walmart where I purchased several SanDisk Ultra flash drives. Presumably, the more expensive SanDisk Ultra flash drives will prove more reliable than the older SanDisk Cruzer drives.

Henceforth, I'll create new boot drives every time I create a new disk image and rotate my flash drives so that I always have three recent boot drives to fall back on. I'll also burn a bootable DVD every so often. Having the Acronis boot program on both flash drives and DVDs provides peace of mind.

I embarked on this project because my DVD writer stopped working. Turned out that the DVD writer was good. A twelve dollar power cable failed for no apparent reason but I had to drive sixty miles to find a replacement.

I use the same approach to protecting my wife's Windows 10 machine, using only one external drive. Her only applications are an internet browser, an email client and Picasa. Her My Documents folder gets backed up to an external hard drive and to Norton Secure Storage. Because she's cramped for desk space, I bought her an inexpensive all-in-one. ***Should repairs be necessary, I might be obliged take it to a local shop. My fingers are too big to poke around in the innards of a laptop or a compact desktop.***

***If you're working without convenient access to corporate, department or institutional technical support:***

- Subscribe to the [3-2-1 Rule](#). Data redundancy is your friend.
- Replace any computer running an operating system older than Windows 7.
- Consider replacing any computer once the operating system reaches the end of its life cycle. See <http://windows.microsoft.com/en-us/windows/lifecycle>.
- Computers designed for Windows XP and Windows Vista cannot easily be upgraded to Windows 7 or later, required by much of the newer software.
- ***Do not run mission-critical applications without an uninterruptable power supply with built-in surge protection. You can buy one at Walmart for sixty bucks. Without effective surge protection, a lightning strike twenty miles away can fry your hard drive. Another lesson learned the hard way.***
- Purchase an external hard drive large enough to accommodate everything on your boot and data drives with room to spare. You can buy a good one for around one hundred dollars. Being somewhat paranoid, I have two.
- Purchase a current copy of disk imaging software. Acronis True Image is not the only game in town but it's easy to use and makes everyone's top ten lists.
- Download GFI Backup Free from <http://gfi-backup.en.softonic.com>. I've used it for years on a variety of computers with never a glitch.
- Subscribe to an on-line backup service. I use Norton because the software is baked into Norton 360 but I'd be inclined to trust Acronis and Carbonite.
- Homeland Security advises subscribing to two Cloud backup services because these companies tend to go out of business at regular intervals.
- Since *Practical Police Photography* is a modest money-maker, I upload a copy of the current manuscript to forensic-photography.com at IX Web Hosting.
- Install the best anti-virus and internet security programs that you can find. I run Norton 360, Norton Utilities and Super Anti-Spyware every night.
- I leave my computer on 24/7 because my anti-virus and backup programs run overnight. ***I run the anti-virus utilities before running the backup utilities.***
- Norton and McAfee hit every list of top-ten anti-virus software programs.
- Technical support people invariably recommend Malewarebytes and CCleaner. I run the free (non-memory resident) versions of these programs every so often and occasionally they'll turn up something that the other programs missed.

- I use Revo Uninstaller Pro to monitor new software installations and all software deletions. The uninstaller built into most applications will leave your computer and your registry cluttered with left-over files and folders.
- Keep your original installation media, serial number, product keys and passwords in a safe place, preferably a fireproof and waterproof data safe.
- Visit <http://www.klsecurity.com/index.php> to see what's available.
- Make sure that you can create an image of your boot disk on at least one external hard drive and either a network file server, a Cloud-based backup service or a second external hard drive.
- ***Make sure that your computer can recognize and boot from your rescue DVD and a bootable thumb drive. Make multiple copies at regular intervals. Keep them in a safe place. Keep your fingers crossed.***

Microsoft tells me that it is possible to install Windows 10 on an XP machine if you purchase the thumb drive version rather than the downloaded version. I didn't try it. My experience with chancy upgrades has left me skeptical.

When my current XP machine finally gives up the ghost, I'll purchase a tower computer with a 64 bit Intel Core i5 quad-core processor, 16 GB of RAM, a 250 GB SSD boot drive, a 500 GB HDD data drive and the latest 64 bit Windows operating system. ***While overkill for my current requirements, having extra horsepower under the hood is insurance against premature obsolescence.***

***Virus infections are transmitted via incautious Internet browsing and unsolicited email messages and attachments. The more pernicious virus infections can get by even the best firewall and evade the strongest real-time anti-virus protection.***

***Your first line of defense is using a department- or institution-issued computer strictly for the intended purpose. Your second line of defense is doing full system scans and incremental backups every night. Quickie scans may not be enough to detect the new viruses which pop up at regular intervals.***

***Computer repairs take time. If you can't live without your computer for a week or two, buy a laptop that will satisfy your basic requirements. You can usually find a 15" laptop with a decent screen, a good keyboard, 4 GB of RAM and a 500 GB drive on sale for three hundred dollars at Walmart or Best Buy.***

## Freebies

The student on a Ramen noodle budget or someone buying a backup computer to avoid downtime while his or her primary computer is in the shop doesn't want to spend a lot of money on software. There are a number of free programs that will satisfy modest and/or short term requirements.

[Avast Free](#) or [AVG Free](#) (Upgrade to a paid AV program for the long haul.)

[Malwarebytes](#)

[CCleaner](#)

[Revo Uninstaller](#)

[Mozilla Firefox](#), [Google Chrome](#) or [Opera](#)

[Mozilla Thunderbird](#) or [Opera Mail](#)

[LibreOffice](#) (Similar to but slower and clunkier than Microsoft Office.)

[Faststone](#) (My preferred JPEG editor and front end file manager for Photoshop.)

*An internet browser, an email client, a rudimentary AV program and Wordpad (a basic text editor) are baked into most versions Windows.*

*I've got a three user license for Norton 360 (replaced by [Norton Security Premium](#)) and the Norton Utilities. Since I'm only using two machines, I'm better off adding a third machine to my existing Norton license rather than experiment with another AV product.*

*Ditto Acronis True Image.*

*Free alternatives to Microsoft Word will suffice for the occasional memo. For serious writing and editing, I'll scour the Internet for Microsoft Office 2010. It's the devil that I know. I put LibreOffice on my wife's machine.*

*Faststone has everything that I need in a JPEG editor plus a fast browser and a good file manager. If you're happy with something else, stick with it.*

*I like the Revo Uninstaller better than the uninstaller in CCleaner. You'll want a good uninstaller to get rid of the crapware that comes on a new computer and any trial software that doesn't work out to your satisfaction.*