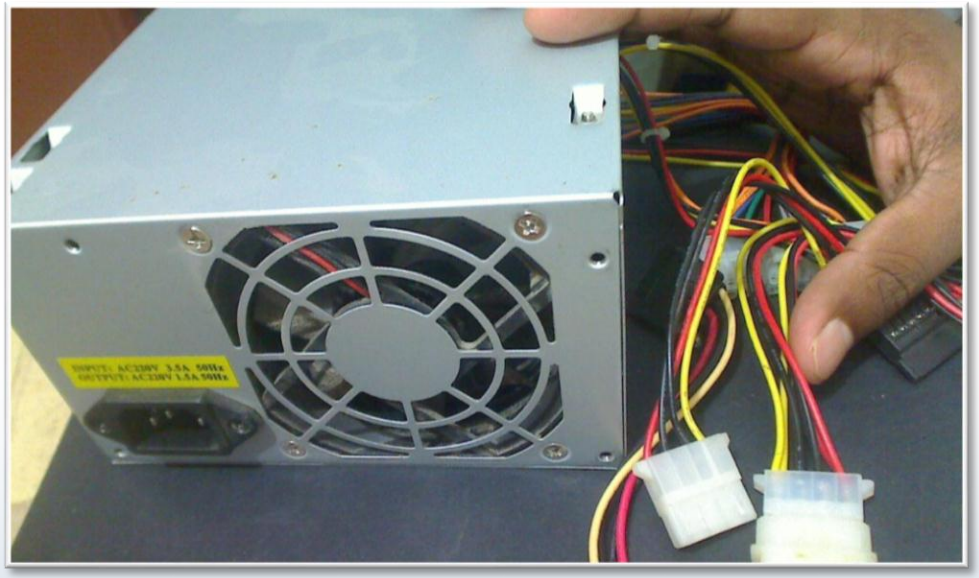
OPERATIONAL PROCEDURES



Outline

- Basic Tools
- Additional Tools
- Network Tools
- Circuit Board Toolkit
- Software Diagnostic Tools
  - Event Viewer
  - Performance Monitor
  - Device Manager
  - Direct X Diagnostic Tool
  - SMART
  - Other Software Diagnostic Tools
- Motherboard/CPU Diagnostic Tools

Outline

- Memory Diagnostic Tools
- Video Diagnostic Tools
- Software Diagnostic Tools
- Maintenance Techniques
- Cleaning Techniques
- Cleaning Tools
- Documents and Resources
- Compliance and Government Regulations
- Electrical Safety
- ESD Prevention
- Electromagnetic Interference
- EMI Prevention
- Power Supply

Outline

- Electrical Hazards
- Electrical Safety
- Environmental Safety
- Workplace Safety
- Power Issues
- Power Protection System
- Professionalism
- Personal Conduct
- Prohibited Conduct Best Practices
- Computer Forensics

- Pen and pencil
- Phillips head screwdriver
- Flat head screwdriver
- Small Flashlight
- Container for screws
- Nut driver

Additional Basic Tools

- Additional drivers
- Torx Driver
- Tweezers

Additional Basic Tools

- Three prong retriever
- Ratchet
- Allen wrench

Additional Basic Tools

- Cotton swabs
- Batteries
- Anti-static swabs

Additional Basic Tools

- Anti-static wrist band
- Compressed air canister

Additional Basic Tools

- Mini vacuum
- Pen knife

Additional Basic Tools

- Clamp
- Chip extractor
- Chip inserter

Additional Basic Tools

- Multimeter
- Soldering iron
- Circuit tester
- Drive adapters
  - (SATA, PATA, USB)

- Cable crimper
- Wire stripper

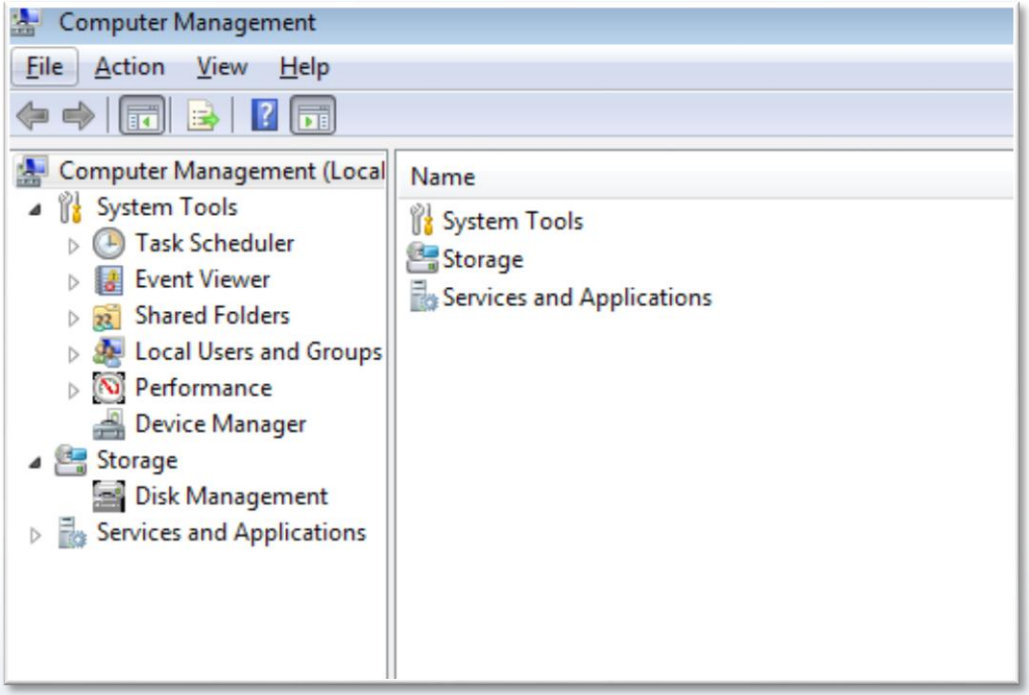
- Wire cutters
- Cable tester

- Punchdown tool
- Curved forceps
- Multimeter

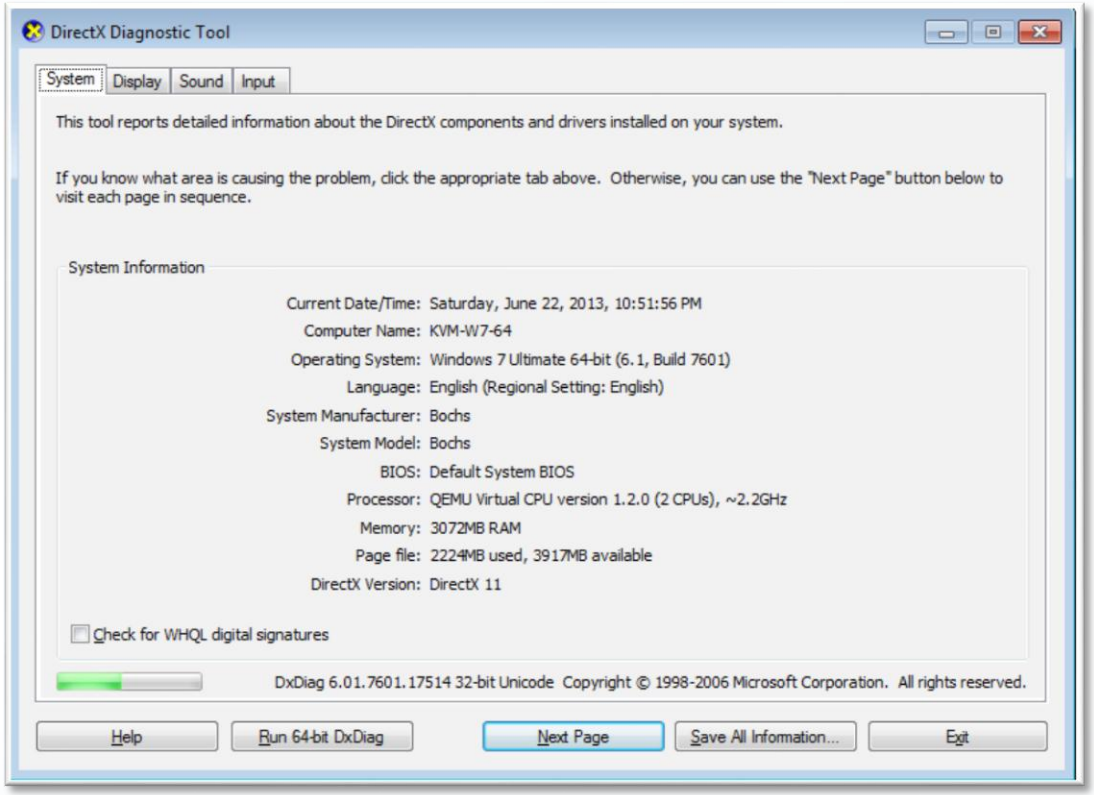
- Soldering iron
- Soldering braid
- Desoldering pump
- Solder

- Small pliers
- Small wire cutters
- Heat sink

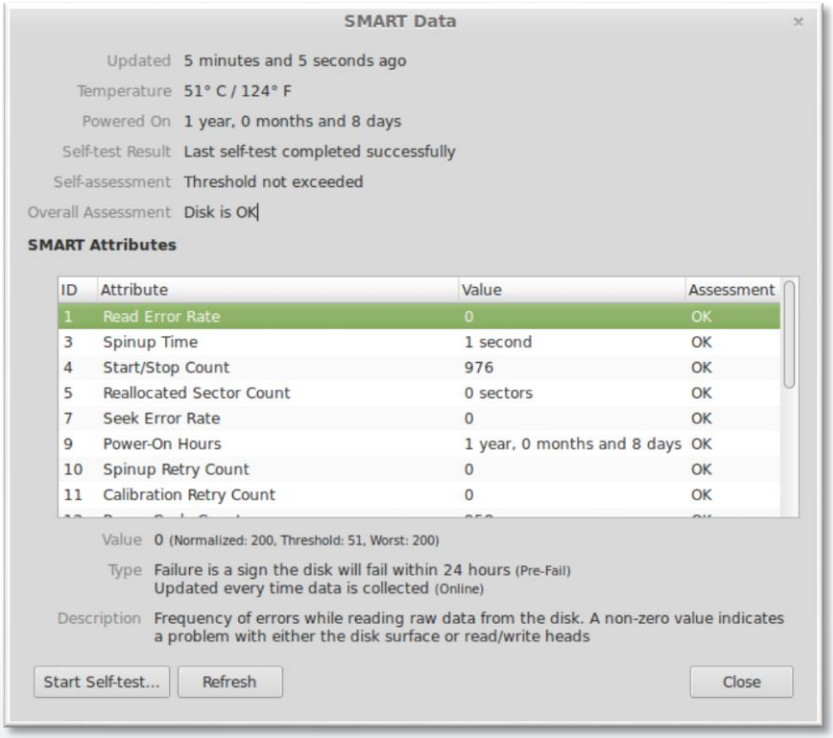
- **Windows 7 Computer Manager**
  - Event Viewer
  - Performance Monitor
  - Device Manager



- # Direct X Diagnostic Tool



- **Hard Drive**
  - Software built in from the manufacturer
  - SMART - Self-Monitoring, Analysis and Reporting Technology

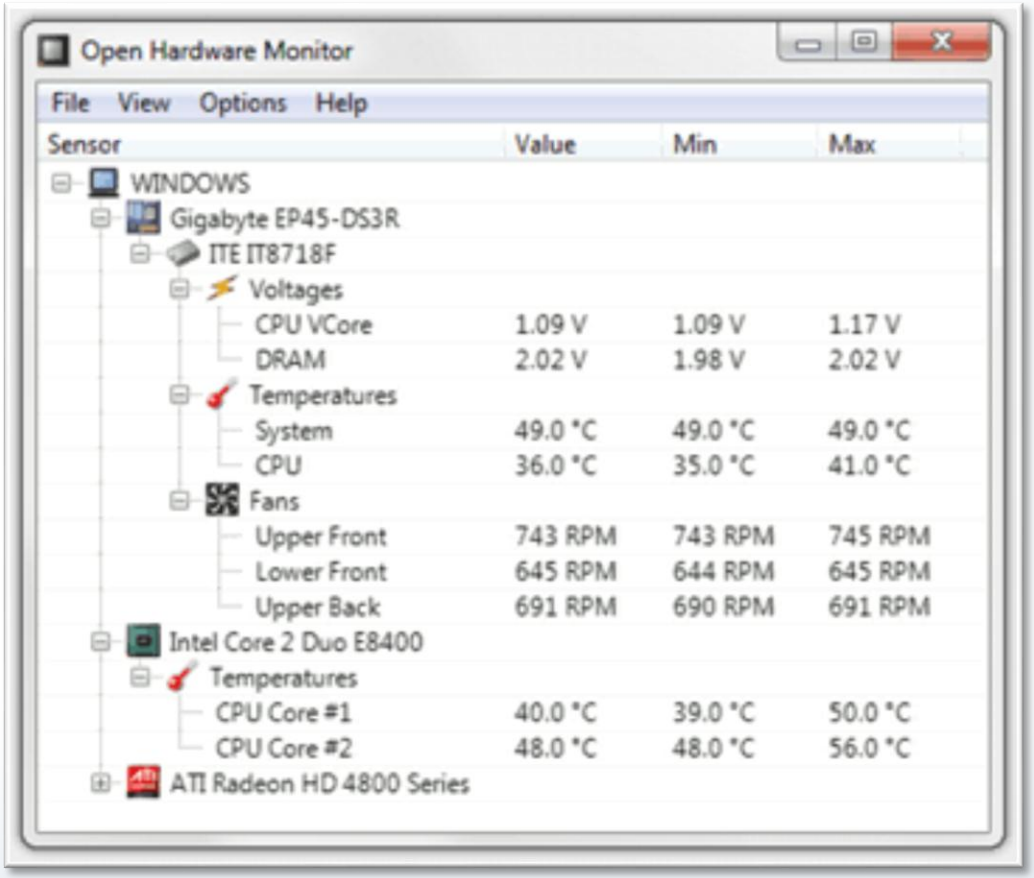


- **Other**
  - PC-Doctor
  - PC-Diag
  - Norton SystemWorks
  - QuickTeck Pro
  - McAfee System Mechanic
  - CheckIt Diagnostics

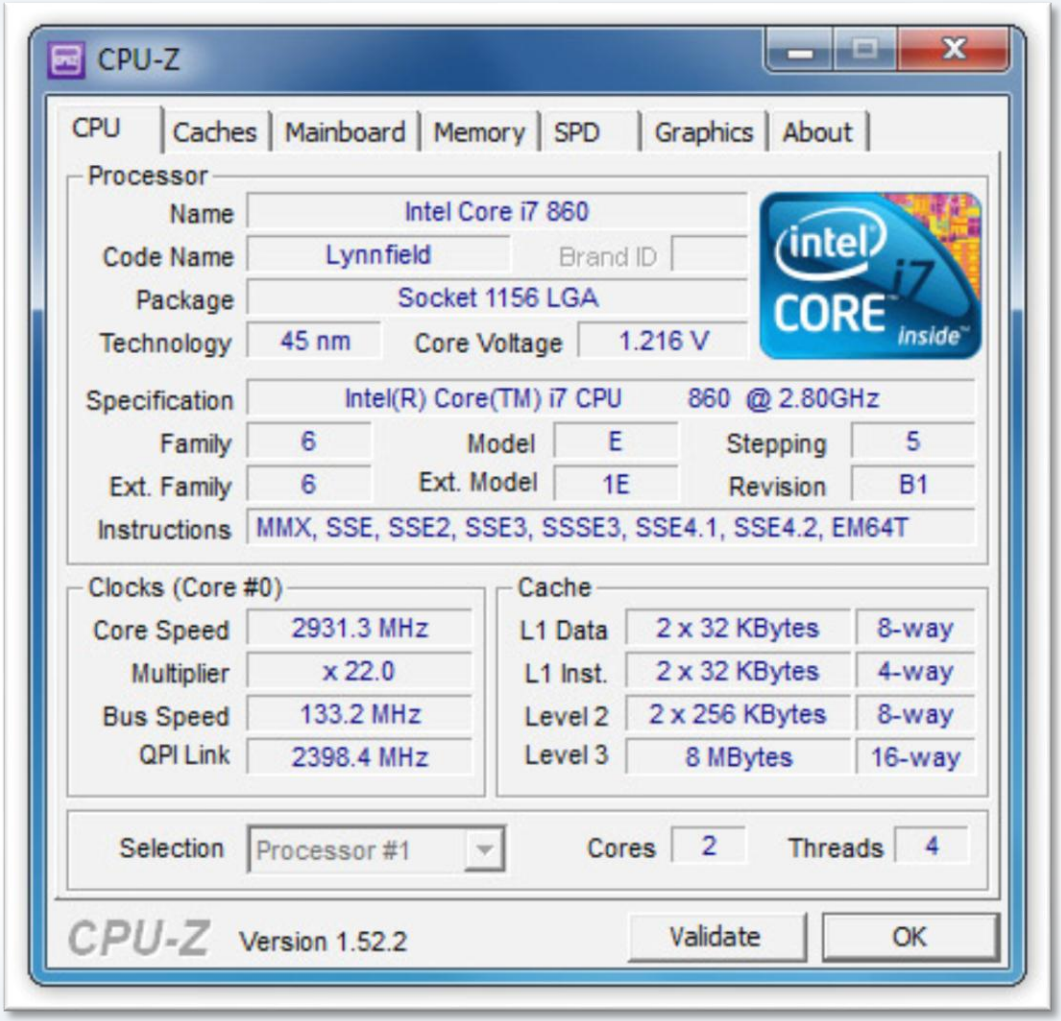
- **Other**
  - PC-Doctor
  - PC-Diag
  - Norton SystemWorks
  - QuickTeck Pro
  - McAfee System Mechanic
  - CheckIt Diagnostics
  - Anti-virus, malware, spyware

Motherboard/CPU Diagnostic Tools

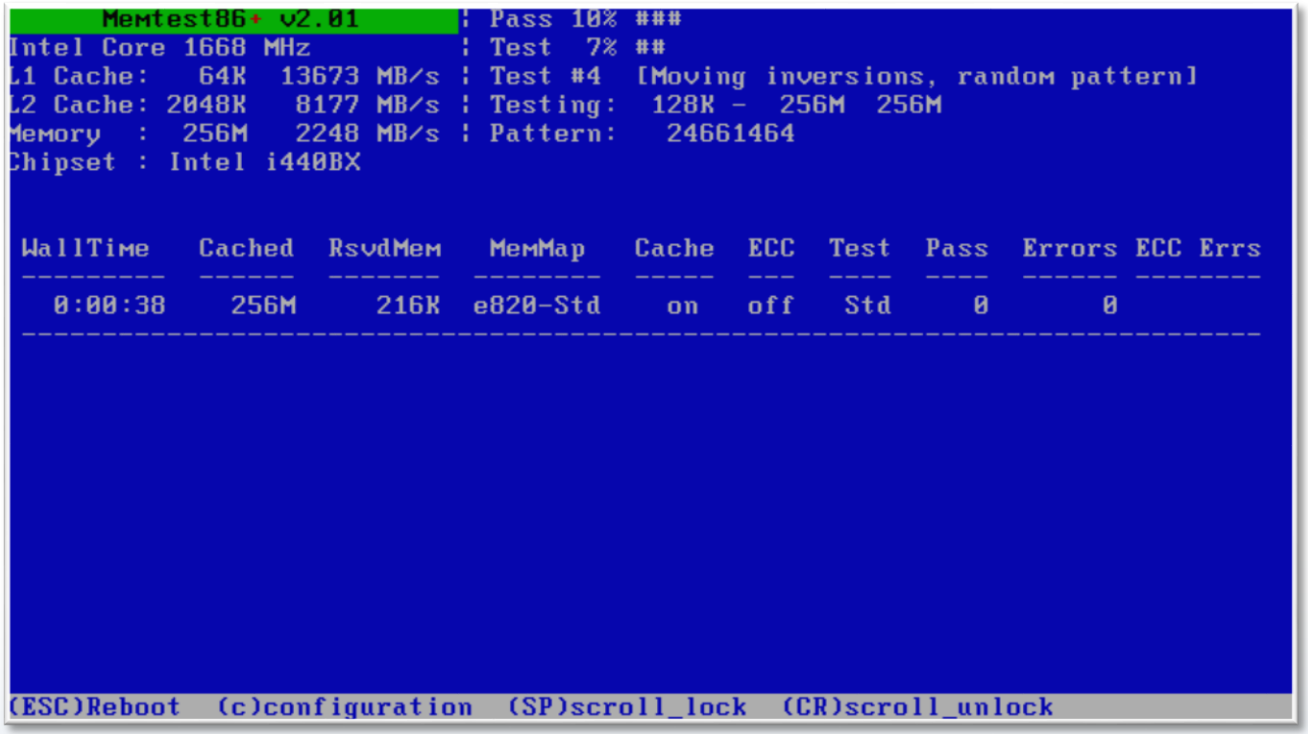
- POST – Power On Self Test
- BIOS – Basic Input/Output System
- x86test
- CPU-Z
- Fan
  - BIOS
  - SpeedFan



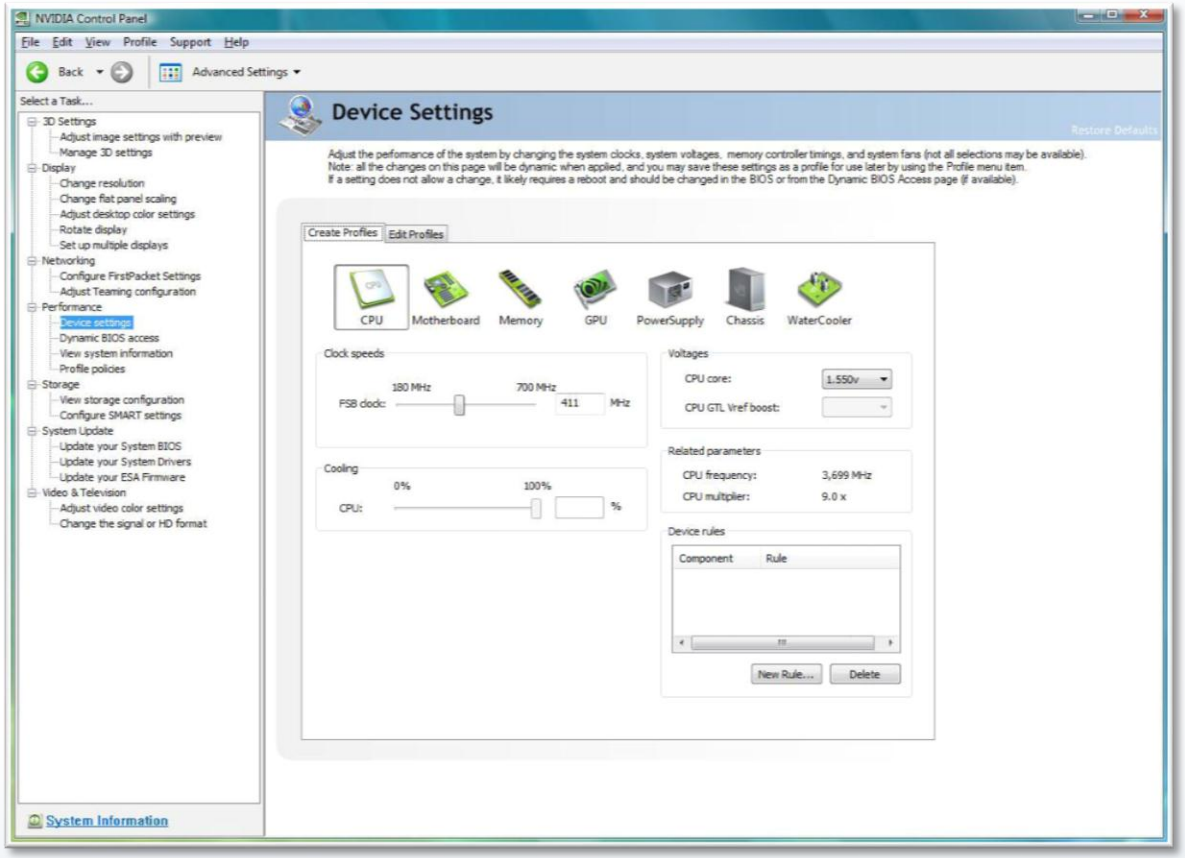
Motherboard/CPU Diagnostic Tools



- POST – Power On Self Test
- BIOS – Basic Input/Output System
- Memtest86+
- CPU-Z



- Direct X Diagnostics
- Manufacture Software
- POST
- BIOS



- **Other**
  - PC-Doctor
  - PC-Diag
  - Norton SystemWorks
  - QuickTeck Pro
  - McAfee System Mechanic
  - CheckIt Diagnostics

- **Power**
  - Surge protector
  - UPS – uninterruptible power supply
- **Clean components**
  - Dust build up – mini vacuum, compressed air

- **Monitor CRT**
  - Alcohol wipes
  - Lint free
  - DO NOT USE WINDOW CLEANER – removes anti-glare
- **Monitor LED / LCD**
  - Specialized cleaning solution
  - Microfiber cloths
  - Distilled water
  - Water/vinegar
  - Lint free cloth
  - Keyboard and Case
  - Alcohol wipes
  - Pre-moistened wipes

Cleaning Tools

- Cotton swabs
- Toothpicks – tight spaces, keyboards
- Small clean paint brush
- Compressed air canister
  - Keep upright
  - Not too close to avoid freezing
- Wear masks and gloves while using compressed air or working around toner spills

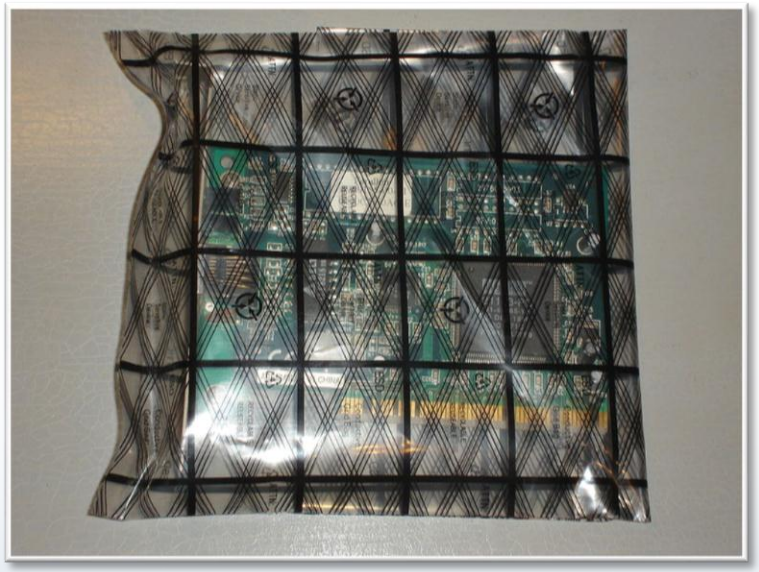
Documents and Resources

- User Installation Manuals
- Internet / web – search engine, forums, knowledge bases, wikis
- Manufacture training material

OSHA - Occupational Safety and Health Administration

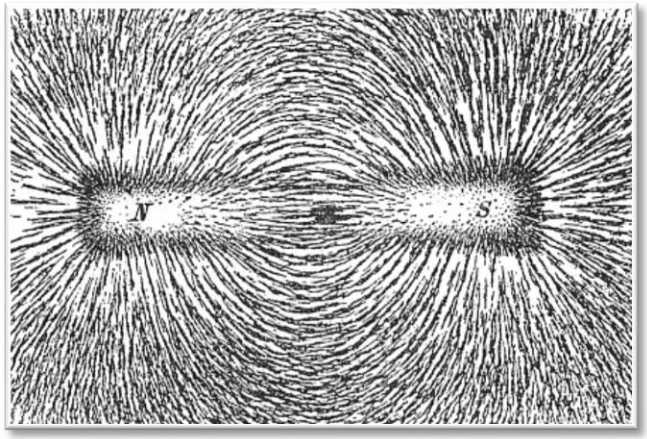
- Static Electricity
  - Built up by friction, rubbing, objects against each-other
  - ~3-20K Volts
- ESD – Electrostatic Discharge – the discharge of electricity from one object to another

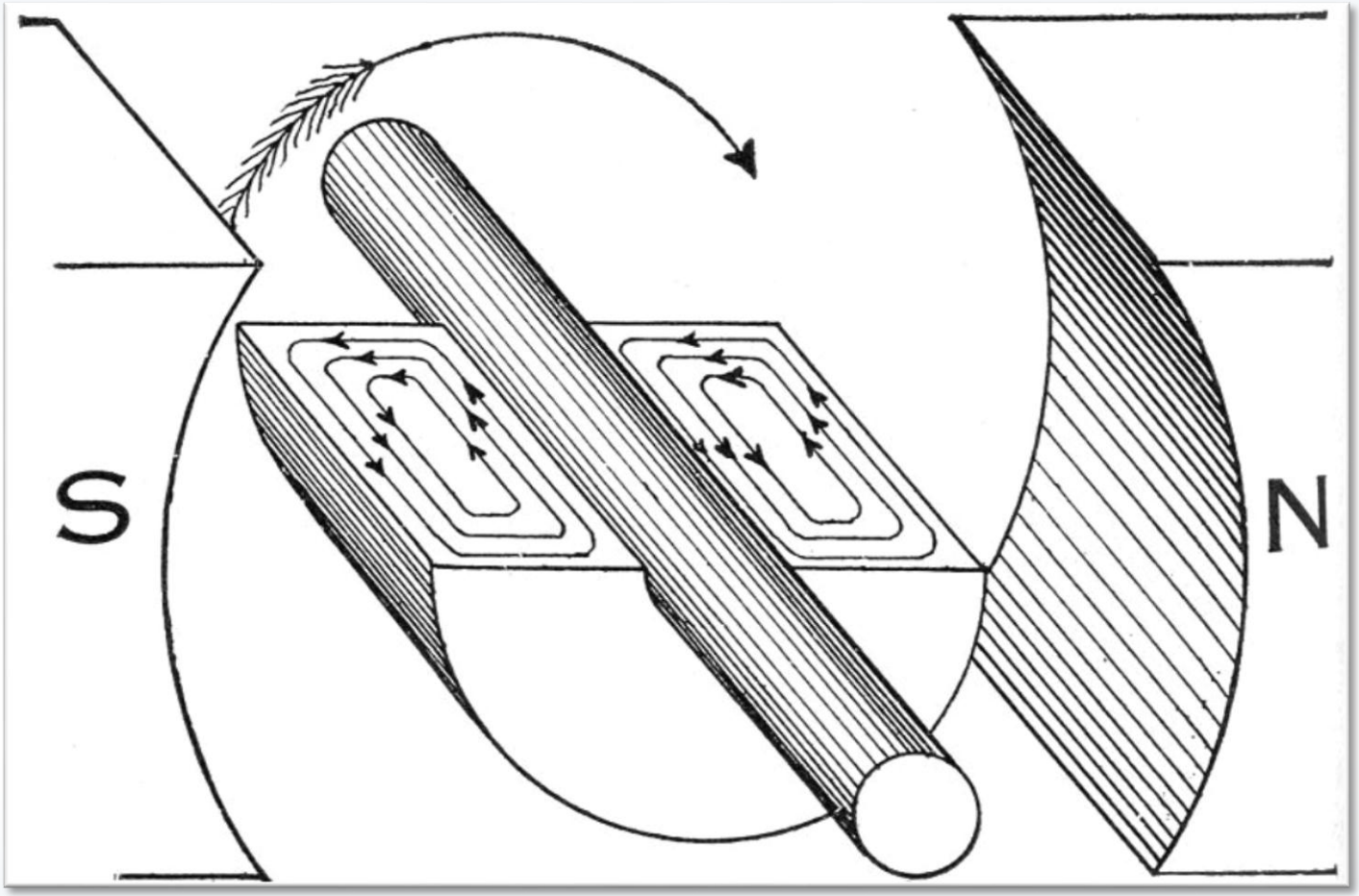
- Eliminate ESD generation activities
- Self grounding/pads – ground yourself before touching electrical equipment to a grounded object or pads
- Use ESD straps
- Use anti-static vacuum
- Use ESD bags to store computer components



- Use air ionizer
- Humidify the air to 50-60 percent

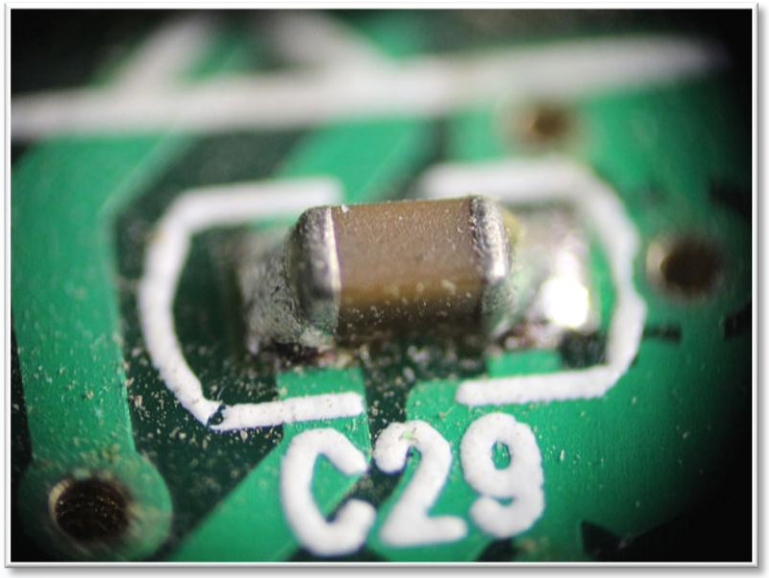
- EMI
- Electromagnetic field is created by:
  - magnets
  - any electrical device while on
- Electromagnetic field induces electricity to any wire causing interference with signals in circuits, network communications, wires, etc.

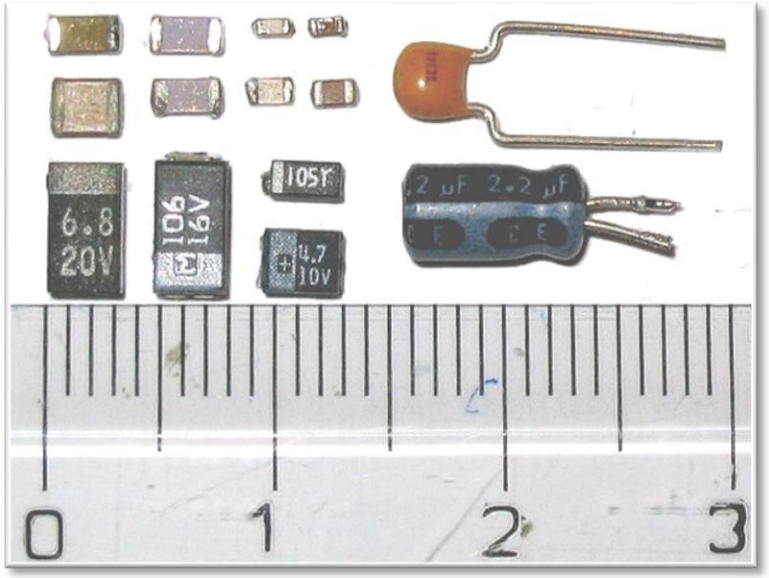




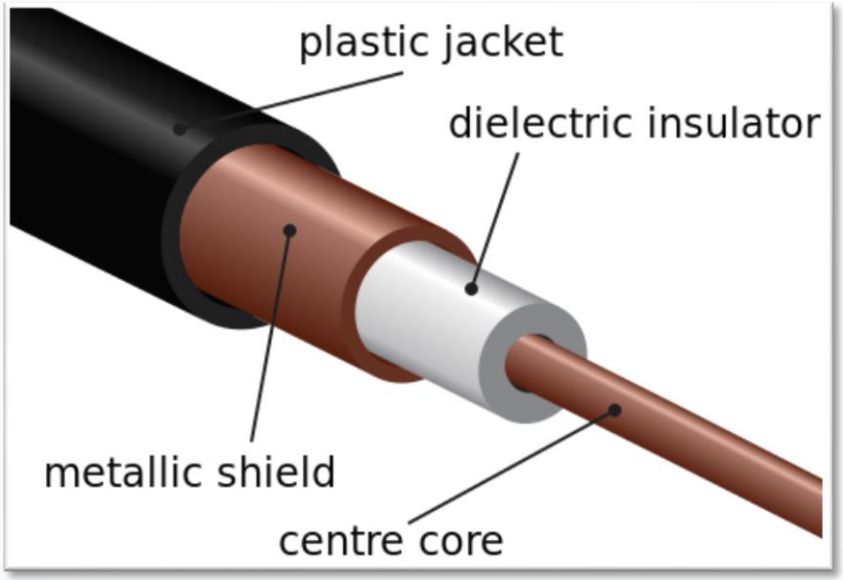
- Type of cables/wires
  - Twisted pair cable/wires
- Avoid
  - Fluorescent lights
  - AC powered cables/wires
- If you cannot avoid powered cables/wires/devices
  - Cross it at 90 degrees

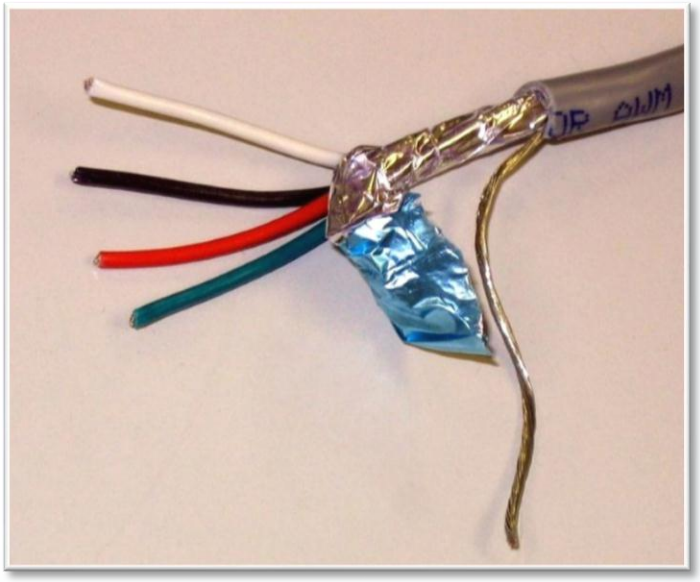
- Surface Mount Devices on circuit boards
- Captures EMI electricity and prevents issues with EMI





- EMI Shielding
- Shielding cables
- Shielding cases around circuitry





Power Supply

- Computers generally use low voltage and current
- Power supply have higher voltage and current on the input side which can be life threatening
- Replace vs. repair

- Shock
  - Increase risk with wet objects
- Electrocution (fatal shock)
  - Extent of injury depends on the current and pathway through the body
- Burns
  - External and internal
- Indirect physical bodily damage
  - Falls, muscle contractions, fractures

Power Supply

- Computer circuitry is low voltage and current
- Input to power supply is higher voltage and current
- Disconnect power cord and press power button to dissipate charges
- Replace rather than repair

CRT Display

- CRT voltage and current is very high (35,000 V)
- Electricity is stored in capacitors months after power is disconnected
- DO NOT tap or strike exterior – broken glass
- DO NOT open external case
- Replace with LCD/LED vs repair
- Dispose of CRT/recycle properly

Printer

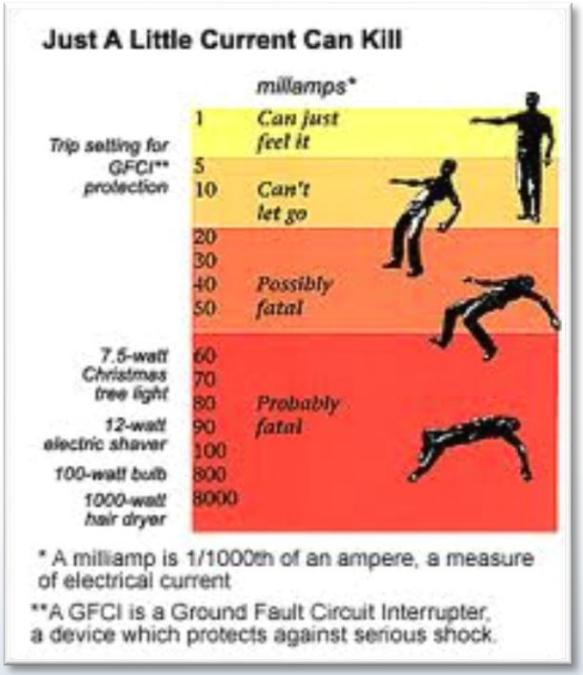
- High Voltage
- Rollers and wires can hold electricity
- Clean up the printer and follow manufacturer safety when working with a printer

ESD

- All ESD (Electrostatic Discharge) precautions increase risk of electrocution
- Anti-static wrist bands and grounding provides a low resistance pathway for electricity
- Avoid anti-static devices when operating near high voltage devices
- Wear rubber boots/shoes to insulate yourself

Personal Safety

- Disconnect power before repair/replace
- Be well rested
- Make no assumptions!
- Remove jewelry
- Wear rubber soled shoes for insulation



Environment

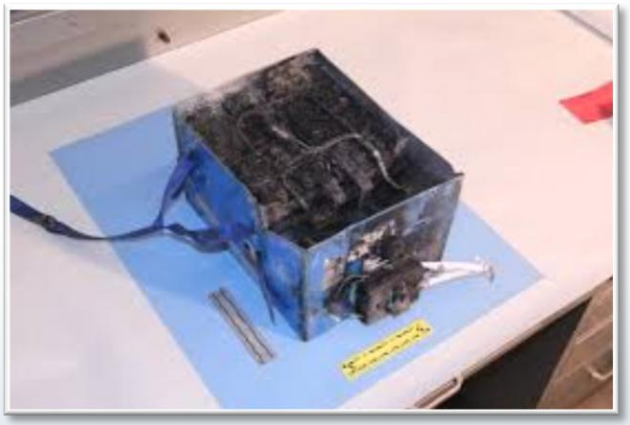
- Avoid work during electrical storms
- Do not work near electricity when you are wet
- Turn the power off before working

Disassembly

- Ensure components are dry after cleaning
- Label wires and connectors as they are detached so that can be reattached properly
- Ensure all wires are inside when replacing a computer case

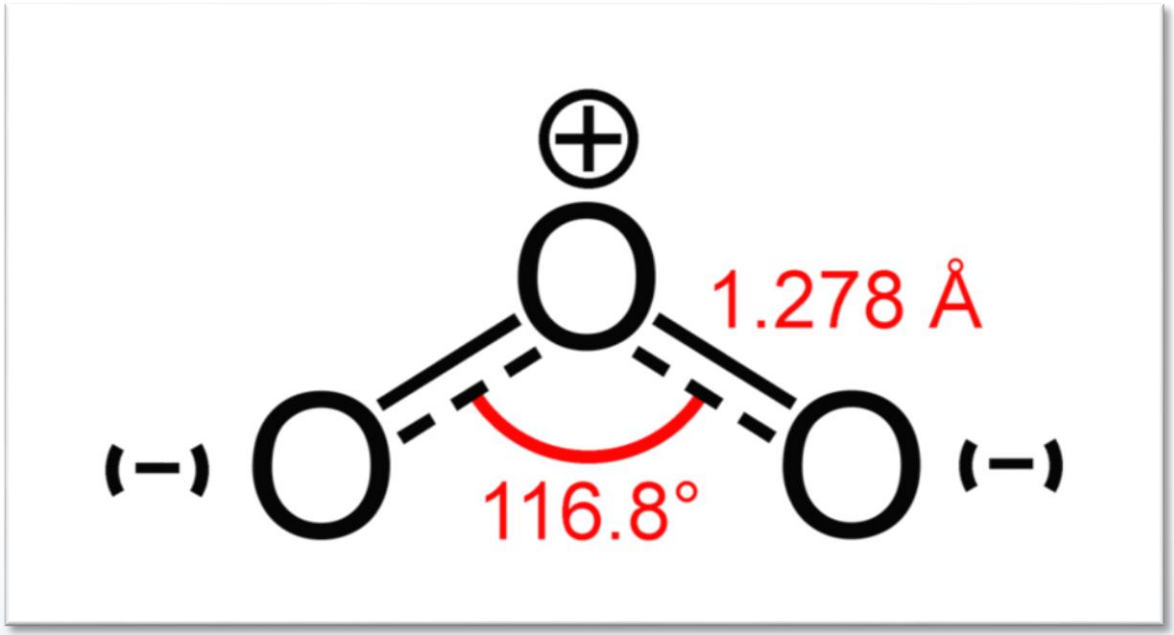
Fire Safety

- Check wires
- Replace worn, old, damaged wires
- Verify smoke, heat, flame detectors work
- Do not use water!
- Class ABC extinguishers (dry chemical) can damage electronics
- Use inert gases such as halocarbon, CO2, etc.
  - All work by starving fire of O2 which is harmful to human life



Ozone

- Ozone (O3) gas – produced by the corona wire in printers
  - Mild to severe irritant
  - Ventilate!



Temperature and Humidity

- High temperatures - overheating
- Low temperatures - condensation of water
- High humidity – corrosion
- Low humidity – greater static charge buildup
- Target 65 – 75 degrees F and 40-60 % humidity

Dust and Particles

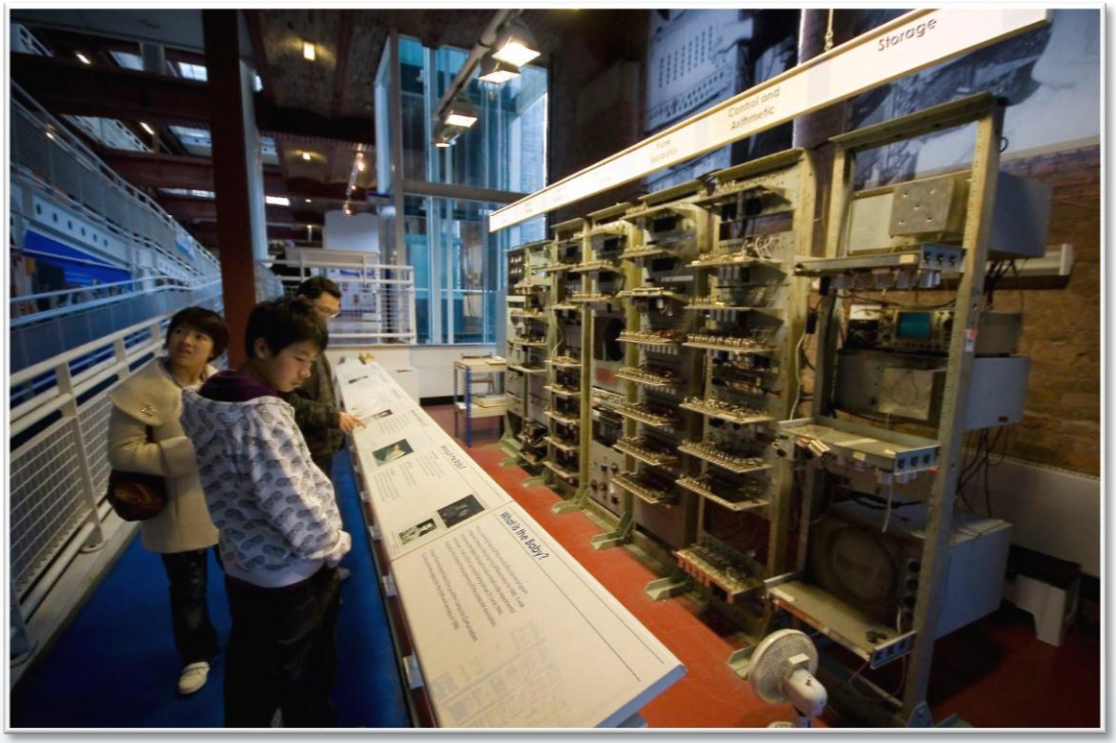
- Builds up over time
- Resistance for moving parts – fans, motors
- Decreases heat dissipation and increased operating temps – system crashes, fire hazard
- Prevent with filtered HVAC systems
- Remove with compressed air / vacuums

Fall/ Trip

- Keep wires and cables from high traffic areas
- Be aware of the location of wires and cables
- Bind, secure, tape down wire/cables

Storage

- Avoid stacking equipment
- Ensure stability



Component Handling

- Be careful, electronic components are delicate and expensive!
- Use tools designed to remove/insert
- Place electronics on ESD bags

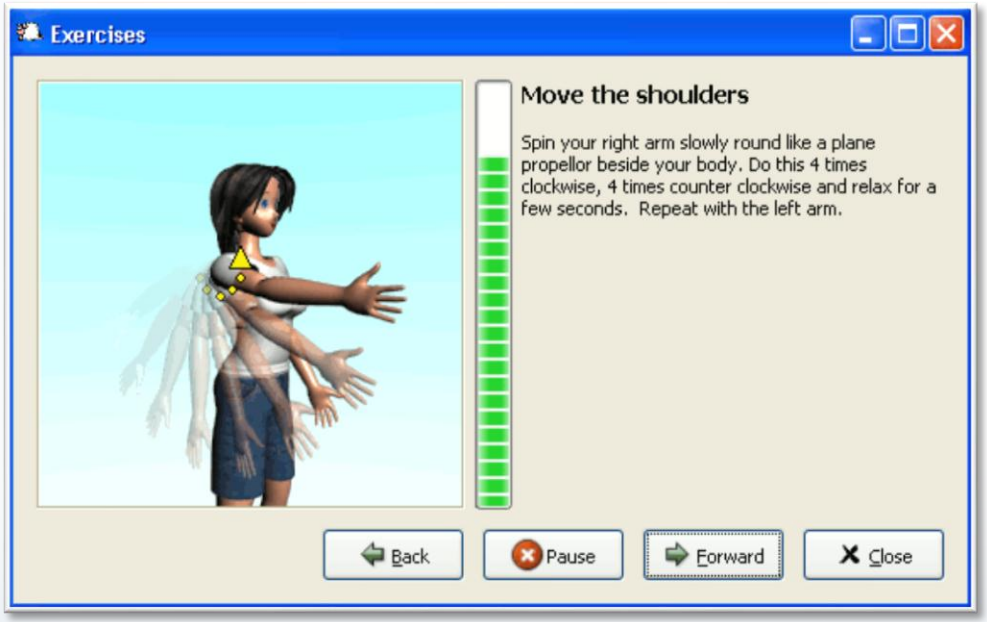
Repetitive Strain Injury (RSI)

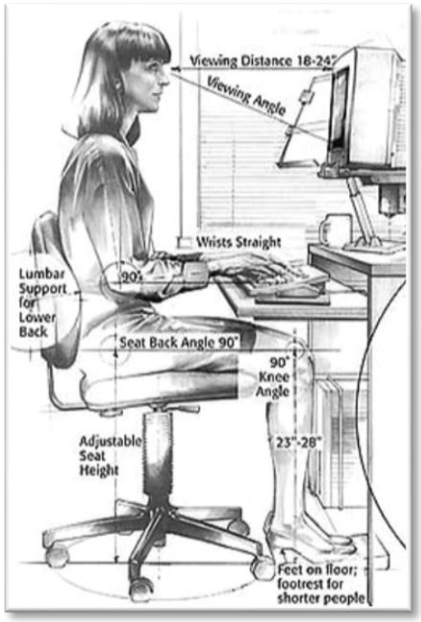
- Caused by overuse or abuse of muscles, tendons, and nerves
- Can cause injury to hands, arms, shoulders, neck, and back
- Signs: tenderness, swelling, pain, cracking, numbness, loss of strength, loss of join range of motion
- Evidence indicates poor health from sitting for long times

Repetitive Strain Injury Prevention

- Take regular small (30s every 10-15 min), medium (5-10m every 1 to 1.5 hours) breaks
- Limit total time working on a computer to less than 10 hours
- Exercise regularly
- Stand and move around as much as possible
- Consider using a standing desk and trackball
- Use RSI prevention software - Workrave

Repetitive Strain Injury Prevention





Eye Strain/ Dry Eyes

- Caused by maintaining an active focus at short distances (display). Decreased blinking.
- Signs: blurred vision, difficulty focusing, double vision, tiredness, headache, burning, sore, or itchy eyes
- Prevention: same as RSI prevention

Radiation

- Users have expressed a concern for electromagnetic radiation (EMF generation) from computers
- Current research does not identify a health risk

Noise

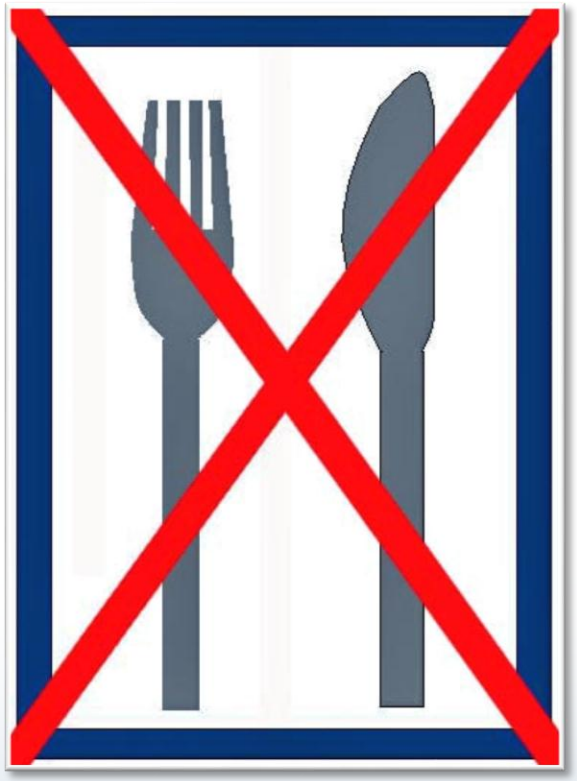
- Majority of noise from computers are far below occupational standards
- Loud noise?
  - Check for a malfunction
  - Use sound deadening materials and limit exposure

Hot Components

- Many components can get hot during operation, especially high performance CPU and GPU
- Allow to cool down before touching

Food and Drink

- Avoid eating or drinking around computers and electronics
- Food particles and liquid can damage electronics from spills and accidents



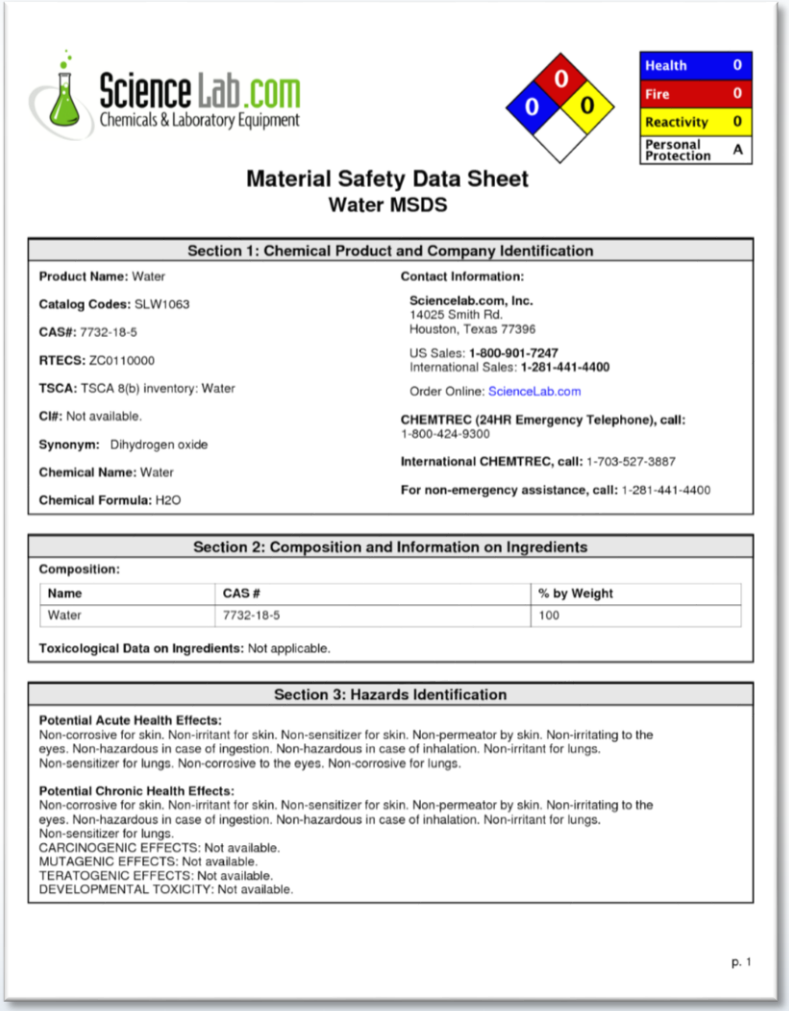
Chemicals

- Laser printer toner
  - Heat reactive
  - DO NOT wash skin with warm water
  - rinse with cool water
  - Do not vacuum, brush off
  - Avoid ammonia cleaners – reaction
- Batteries – mercury, cadmium, lithium
- Capacitors
  - Stored power shock
  - Multiple chemicals

MSDS

- Materials Safety Data Sheet
- Provides information about hazardous products
- OSHA requirement
- Required information: physical data, toxicity, health effects, first aid, reactivity, storage, safe handling and use, disposal, protective equipment, spill/leak procedure

MSDS



ScienceLab.com
Chemicals & Laboratory Equipment

Health	0
Fire	0
Reactivity	0
Personal Protection	A

Material Safety Data Sheet
Water MSDS

Section 1: Chemical Product and Company Identification

Product Name: Water

Catalog Codes: SLW1063

CAS#: 7732-18-5

RTECS: ZC0110000

TSCA: TSCA 8(b) inventory: Water

CI#: Not available.

Synonym: Dihydrogen oxide

Chemical Name: Water

Chemical Formula: H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects:
Non-corrosive for skin. Non-irritant for skin. Non-sensitizer for skin. Non-permeator by skin. Non-irritating to the eyes. Non-hazardous in case of ingestion. Non-hazardous in case of inhalation. Non-irritant for lungs. Non-sensitizer for lungs. Non-corrosive to the eyes. Non-corrosive for lungs.

Potential Chronic Health Effects:
Non-corrosive for skin. Non-irritant for skin. Non-sensitizer for skin. Non-permeator by skin. Non-irritating to the eyes. Non-hazardous in case of ingestion. Non-hazardous in case of inhalation. Non-irritant for lungs. Non-sensitizer for lungs.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.

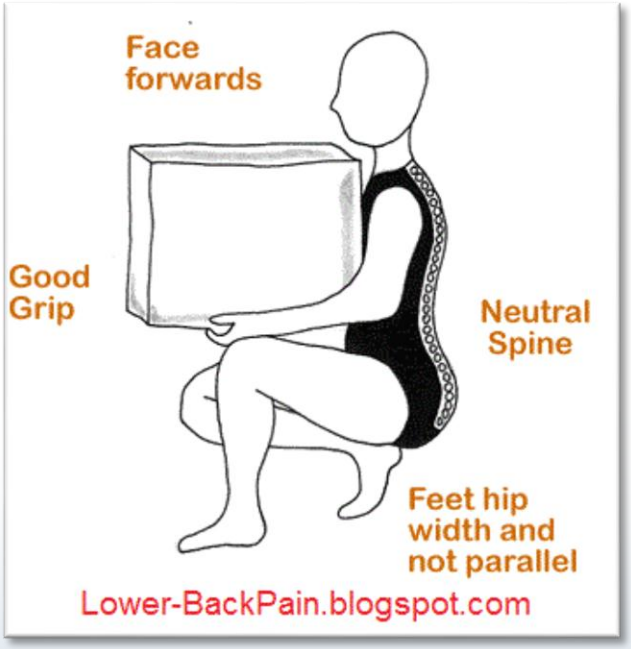
p. 1

Hazardous Material Disposal

- Liquid Cleaners – follow manufacture / organization guidelines
- Toner – Send to manufacturer for recycle or disposal. Do not place in trash
- CRT – Many regulations prohibit landfill. Recycle or follow organizational policy
- Ozone filter – see manufacturer guidelines
- Batteries – Recycle or follow organizational policy

Moving Equipment

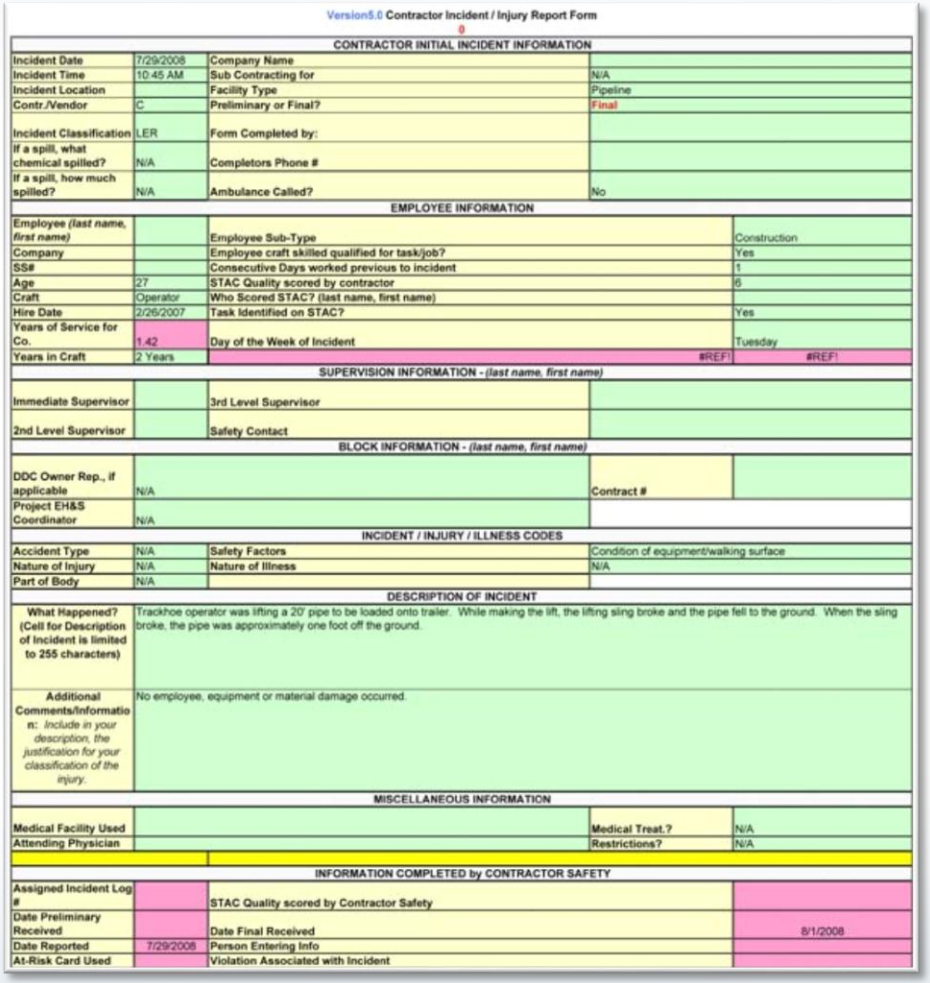
- Improperly lifting heavy objects can cause injury
- Know your limits
- Bend at knees, not at waist
- Strengthen stomach muscles and keep back in alignment
- Get help!
- Use moving equipment
- Plan before the move



Incident Report

- Report to capture event information when:
  - Injuries occur
  - Accidents
  - Chemical spills
- When the event could cause environmental impact or impact organization operations.

Incident Report



Version5.0 Contractor Incident / Injury Report Form

0

CONTRACTOR INITIAL INCIDENT INFORMATION			
Incident Date	7/29/2008	Company Name	
Incident Time	10:45 AM	Sub Contracting for	N/A
Incident Location		Facility Type	Pipeline
Contr./Vendor	C	Preliminary or Final?	Final
Incident Classification	LER	Form Completed by:	
If a spill, what chemical spilled?	N/A	Completors Phone #	
If a spill, how much spilled?	N/A	Ambulance Called?	No

EMPLOYEE INFORMATION			
Employee *(last name, first name)*		Employee Sub-Type	Construction
Company		Employee craft skilled qualified for task/job?	Yes
SS#		Consecutive Days worked previous to incident	1
Age	27	STAC Quality scored by contractor	6
Craft	Operator	Who Scored STAC? (last name, first name)	
Hire Date	2/26/2007	Task Identified on STAC?	Yes
Years of Service for Co.	1.42	Day of the Week of Incident	Tuesday
Years in Craft	2 Years	#REF!	#REF!

SUPERVISION INFORMATION - *(last name, first name)*			
Immediate Supervisor		3rd Level Supervisor	
2nd Level Supervisor		Safety Contact	

BLOCK INFORMATION - *(last name, first name)*			
DDC Owner Rep., if applicable	N/A	Contract #	
Project EH&S Coordinator	N/A		

INCIDENT / INJURY / ILLNESS CODES			
Accident Type	N/A	Safety Factors	Condition of equipment/walking surface
Nature of Injury	N/A	Nature of Illness	N/A
Part of Body	N/A		

DESCRIPTION OF INCIDENT	
What Happened? (Cell for Description of Incident is limited to 255 characters)	Trackhoe operator was lifting a 20' pipe to be loaded onto trailer. While making the lift, the lifting sling broke and the pipe fell to the ground. When the sling broke, the pipe was approximately one foot off the ground.
Additional Comments/Information: *Include in your description, the justification for your classification of the injury.*	No employee, equipment or material damage occurred.

MISCELLANEOUS INFORMATION			
Medical Facility Used		Medical Treat.?	N/A
Attending Physician		Restrictions?	N/A

INFORMATION COMPLETED by CONTRACTOR SAFETY			
Assigned Incident Log #		STAC Quality scored by Contractor Safety	
Date Preliminary Received		Date Final Received	8/1/2008
Date Reported	7/29/2008	Person Entering Info	
At-Risk Card Used		Violation Associated with Incident	

Power Issues

- Blackout – complete loss of power
- Brownout – temporary power reduction, flickering of lights
- Sag – low voltage failure
- Spike – high voltage short term
- Surge – high voltage long term

UPS

- UPS – Uninterruptible Power Supply
- Battery or auxiliary power backup to automatically supply power during power fluctuations/failure
- Temporary
- Designed to allow controlled power down of systems
- Links to systems for automation

Generator

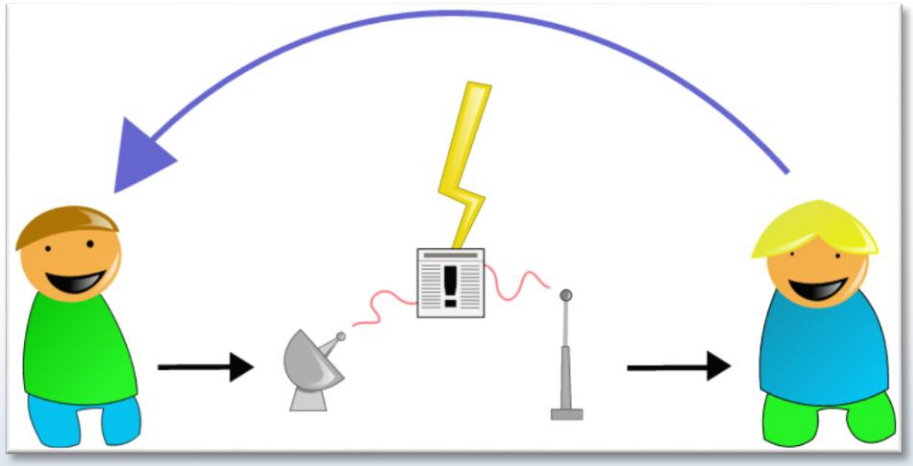
- Generates electricity through mechanical motion usually powered by a combustible fuel
- Can provide medium to long term power
- Found in hospitals, data centers, factories
- Failure when fuel runs out

Surge Suppressor

- Blocks or shorts to ground power spikes to protect equipment
- Rated in joules with a limit to protection capability
- Various sizes
- Can protect network lines as well

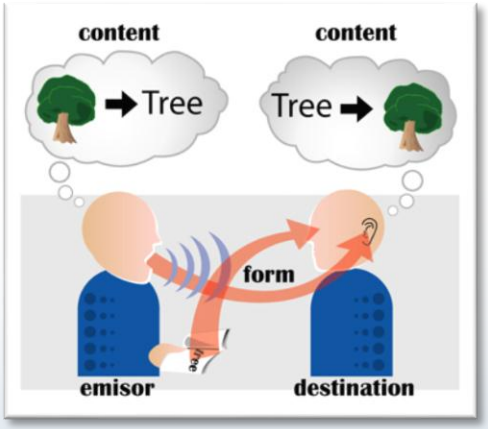
Communication

- Use Proper Language
  - Avoid jargon, abbreviations, acronyms, slang to avoid confusion
  - Use clear, concise, direct statements
  - Use timing effectively
  - Do not be afraid to pause to think about response
  - Ask customer to slow down to get all of the info
  - Step up pace to assist with ending calls



Communication

- Non Verbal Communication
  - Up to 70% of communication is nonverbal
  - Be aware of tone of voice
  - Use proper eye contact
  - Do not stare or leer inappropriately
  - Use gestures and facial expression to reinforce what you are saying
  - “Mm-hmmm” and nods to encourage more information



Communication

- Non Verbal Communication (continued)
  - Respect personal space (2-4 feet)
  - Lower your volume to re-establish calm
  - Use appropriate level of physical contact – ask permission to touch someone or avoid touching it altogether (touching without permission is assault)

Communication

- Listening
  - Do not interrupt
  - Allow the customer to complete their statements
  - Listen for facts, feelings, and thoughts
  - Show you are interested, attentive, and accepting

Communication

- Questions
  - Open ended elicits a description
  - "What happens when you turn on the computer?"
  - Close ended are yes/no or finite choice
  - "Are you able to log in?"
  - Avoid accusations
  - "And why did you do that?"

Communication

- Empathizing
  - Let the customer know you understand their frustrations or situation
  - “I can see why this is frustrating to you.”
  - “I know that when your computer doesn't do what you want it to do, it complicates your day and causes you more work.”
  - “I, too, get frustrated when I see that Blue Screen of Death”

Communication

- Paraphrase
  - State the customer's problem in your own words.
  - Facilitates understanding and allow opportunity for correction
  - “You are saying that...”
  - “I understand...”

- **Appearance**
  - Exude a professional look that meets expectations of the organization's culture
  - Varies by location – repair shop vs. office building
  - Generally be neat, clean, business like dress appearance
  - Wear appropriate safety equipment, hard hat, respirator, etc

- **Respect**
  - Maintain a positive attitude
  - Be culturally sensitive
  - Do not minimize customer problems
  - Never insult a customer
  - Avoid distractions and interruptions
  - Keep your work area clean and organized
  - BE ON TIME
  - Respect the customer's property

- **Accountability**
  - Take responsibility
  - Do not misrepresent credential, experience, competence, or training
  - Admit mistakes
  - Follow organizational policy on accepting gifts and for socializing with customers

- **Confidentiality**
  - IT professionals encounter sensitive or classified information
  - Keep that information secure and do not disclose unless it is approved and necessary
  - Many fields – medical, special education, military, intelligence, etc. have specific laws about confidential information that are applicable to IT professionals
  - Follow organizational policy on confidentiality

- **Honesty**
  - It's the best policy!
  - Be forthright with customers about the situation
  - Discourage software pirating
  - Pirating can carry fines and penalties for IT professionals who participate or look the other way

- Set Priorities
  - Reorganize your work based upon the urgency of a customer's work
  - Base your priorities on courtesy, fairness, accountability, and organizational policy
- Expectations
  - Set and meet them!
  - Establish timeliness and due dates
  - Communicate progress and options
  - Obtain feedback from customers

- Ethics
  - Establish ethical guidelines and use them in how you relate to customers, colleagues, partners, and others
  - Ethical issues a complex and constantly changing
  - Learn your organization's policies and adhere to them
  - Seek clarification from the law, management, and industry practices

- IT professionals commonly encounter prohibited information, data, and conduct
- Range is from inappropriate (using a social network) to illegal (child pornography)
- Follow organizational policy on reporting, collecting, documenting specific incidences of prohibited conduct

- First Response
  - ID hardware or data, removal from use
  - Report details of discovery
  - Preserve data
- Chain of Custody
  - Record of tracking evidence from discovery to presentation in court
  - Includes time/access logs, recording of process, methods, and tools used

- Practice of collecting and analyzing data from
  - Storage devices
  - Computer systems
  - Networks
  - Wireless communications
- Presenting this information to the court
- Fairly new field
- Classically law enforcement agencies, but applicable to security intrusions throughout government, industrial, and private sectors

- Capture system image
- Examine system and network logs
- Capture video and time offset
- Compare file hashes
- Take screen-shots
- Identify witnesses
- Track work hours and expenses to include in damage assessment

THANK YOU