Arizona Department of Education

Career and Technical Education

Recommended Equipment List

Program: Technology Devices Maintenance
CIP#: 15.1202.00

NOTE: The following items and descriptions are the recommended equipment guidelines for each CTE **Technology Devices Maintenance** program. Please note that this list of recommended items does not necessarily need to be supported financially by Federal Perkins or State Priority funding sources. In many cases, local school district funds are used to purchase items on a regular basis (i.e. furniture, consumables, etc.) Further, please understand that this is not an exhaustive list. Local program and business needs may necessitate the purchase of additional equipment and software resources, as may the rapidly-changing nature of the industry-specific technologies used in the program.

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Item	Notes
ESD Tools(2.2.1.2)	ESD tools: antistatic mat. The antistatic mat protects computer equipment by preventing static electricity from accumulating on the hardware or on the technician.
Hand Tools (2.2.1.3) • Flat-head screwdriver: Used to tighten or loosen slotted screws. • Phillips-head screwdriver: Used to tighten or loosen cross-headed screws. • Torx screwdriver: Used to tighten or loosen screws that have a star-like depression on the top, a feature that is mainly found on laptops. • Hex driver: Used to tighten or loosen nuts in the same way that a screwdriver tightens or loosens screws (sometimes called a nut driver). • Needle-nose pliers: Used to hold small parts. • Wire cutters: Used to strip and cut wires. • Tweezers: Used to manipulate small parts. • Part retriever: Used to retrieve parts from locations that are too small for your hand to fit. • Flashlight: Used to light up areas that you cannot see well. • Wire stripper: A wire stripper is used to remove the insulation from wire so that it can be twisted to other wires or crimped to connectors to make a cable. • Crimper: Used to attach connectors to wires. • Punch-down tool: Used to terminate wire into termination blocks. Some cable connectors must be connected to cables using a punch down tool.	Most tools used in the computer assembly process are small hand tools. They are available individually or as part of a computer repair toolkit. Toolkits range widely in size, quality, and price. Some common hand tools and their uses.
Cleaning Tools (2.2.1.4) • Compressed air: Used to blow away dust and debris from different computer parts without touching the components • Parts organizer: Used to hold screws, jumpers, fasteners, and other small parts and prevents them from getting mixed together.	Having the appropriate cleaning tools is essential when maintaining and repairing computers. Using the appropriate cleaning tools helps ensure that computer components are not damaged during cleaning. Cleaning tools include the following:

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Diagnostic Tools (2.2.1.5) • A digital multimeter, as shown in Figure 2-3, is a device that can take many types of measurements. It tests the integrity of circuits and the quality of electricity in computer components. A digital multimeter displays the information on an LCD or LED. • A loopback adapter, also called a loopback plug, tests the basic functionality of computer ports. The adapter is specific to the port that you want to test. • The toner probe, as shown in Figure 2-4, is a two-part tool. The toner part is connected to a cable at one end using specific adapters, such as an RJ-45, coaxial, or metal clips. The toner generates a tone that travels the length of the cable. The probe part traces the cable. When the probe is in near proximity to the cable to which the toner is attached, the tone can be heard through a speaker in the probe.	Diagnostic tools are used to test and diagnose equipment. Diagnostic tools include the following: Although an external hard drive enclosure is not a diagnostic tool, it is often used when diagnosing and repairing computers. The customer hard drive is placed into the external enclosure for inspection, diagnosis, and repair using a known-working computer. Backups can also be recorded to a drive in an external enclosure to prevent data corruption during a computer repair.
Software Tools (2.2.2)	Like hardware tools, there are a variety of software tools that can be used to help technicians pinpoint and troubleshoot problems. Many of these tools are free and several come with the Windows operating system.
Disk Management Tools (2.2.2.1) included • Disk Management Tool: Initializes disks, creates partitions, and formats partitions. • Format: Prepares a hard drive to store information. • ScanDisk or CHKDSK: Checks the integrity of files and folders on a hard drive by scanning the file system. These tools might also check the disk surface for physical errors. • Defrag: Optimizes space on a hard drive to allow faster access to programs and data. • Disk Cleanup: Clears space on a hard drive by searching for files that can be safely deleted. • System File Checker (SFC): A command-line tool that scans the operating system critical files and replaces files that are corrupted.	Software tools help diagnose computer and network problems and determine which computer device is not functioning correctly. A technician must be able to use a range of software tools to diagnose problems, maintain hardware, and protect the data stored on a computer. You must be able to identify which software to use in different situations. Disk management tools help detect and correct disk errors, prepare a disk for data storage, and remove unwanted files. The following are some disk management tools: Use the Windows 7 boot disk for troubleshooting and repairing corrupted files. The Windows 7 boot disk repairs Windows system files, restores damaged or lost files, and reinstalls the operating system. Third-party software tools are also available to assist in troubleshooting problems.

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Item	**Notes**
Protection Software Tools (2.2.2.2) • Windows 10 and on Action Center: Checks the status of essential security settings. The Action Center continuously checks to make sure that the software firewall and antivirus programs are running. It also ensures that automatic updates download and install automatically. • Antivirus program: Protects against virus attacks. • Antispyware program: Protects against software that sends information about web surfing habits to an attacker. Spyware can be installed without the knowledge or consent of the user. • Window 10 Firewall: Runs continuously to protect against unauthorized communications to and from your computer. Diagnostic Software Refer to the worksheet in IT Essentials: PC Hardware and Software Lab Manual.	Each year, viruses, spyware, and other types of malicious attacks infect millions of computers. These attacks can damage operating systems, applications, and data. Computers that have been infected may even have problems with hardware performance or component failure. To protect data and the integrity of the operating system and hardware, use software designed to guard against attacks and to remove malicious programs. Various types of software protect hardware and data:
Organizational Tools (2.2.3)	Keeping accurate records and journals during a busy workday can be challenging. Many organizational tools, such as work-order systems, can help the technician document their work.

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Item	Notes
Reference Tools (2.2.3.1) - Personal Reference Tools, Internet Reference Tools Personal Reference Tools Personal reference tools include troubleshooting guides, manufacturer manuals, quick reference guides, and repair journals. invoices, a technician journal of upgrades and repairs. The journal includes descriptions of the problem, possible solutions that have been attempted, and the steps taken to repair the problem. Note any configuration changes made to the equipment and any replacement parts used in the repair. This documentation is valuable when you encounter similar situations in the future. notes as you go through the troubleshooting and repair process. • Journal: Document the upgrades and repairs that you perform. Include descriptions of the problem, possible solutions that have been tried to correct the problem, and the steps taken to repair the problem. Note any configuration changes made to the equipment and any replacement parts used in the repair. Your journal, along with your notes, can be valuable when you encounter similar situations in the future. • History of repairs: Make a detailed list of problems and repairs, including the date, replacement parts, and customer information. The history allows a technician to determine what work has been performed on a specific computer in the past.	A technician must document all repairs and computer problems. The documentation can then be used as a reference for future problems or for other technicians who may not have encountered the problem before. The documents can be paper based, but electronic forms are preferred because they can be easily searched for specific problems. It is important that a technician document all services and repairs. These documents need to be stored centrally and made available to all other technicians. The documentation can then be used as reference material for similar problems that are encountered in the future. Good customer service includes providing the customer with a detailed description of the problem and the solution.
Reference Tools (2.2.3.1) - Personal Reference Tools, Internet Reference Tools continued… Internet Reference Tools • Internet search engines • News groups • Manufacturer FAQs • Online computer manuals • Online forums and chat • Technical websites	see above

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Miscellaneous Tools (2.2.3.2) Computer replacement parts to include in a toolkit: Case Fan Motherboard CPU Fan Power Supply RAM Hard Drive NIC Sound Adapter Video Adapter SSD	Roll of masking tape can be used to label parts if a parts organizer is not available. A working computer is also a valuable resource to take with you in the field. A working computer can be used to research information, download tools or drivers, and communicate with other technicians.
Hand Tools (2.2.4.3) A technician needs to be able to properly use each tool in the toolkit. This topic covers many of the various hand tools used when repairing computers. Flat-Head Screwdriver Use a flat-head screwdriver when you are working with a slotted screw. Do not use a flat-head screwdriver to remove a Phillips-head screw. Never use a screwdriver as a pry bar. If you cannot remove a component, check to see if there is a clip or latch that is securing the component in place. Phillips-Head Screwdriver Use a Phillips-head screwdriver with crosshead screws. Do not use this type of screwdriver to puncture anything. This will damage the head of the screwdriver. Hex Driver Use a hex driver, to loosen and tighten bolts that have a hexagonal (six-sided) head. Hex bolts should not be over-tightened because the threads of the bolts can be stripped. Do not use a hex driver that is too large for the bolt that you are using.	Match each screw with the proper screwdriver. Place the tip of the screwdriver on the head of the screw. Turn the screwdriver clockwise to tighten the screw and counterclockwise to loosen the screw. Needle-nose pliers and tweezers can be used to place and retrieve parts that may be hard to reach with your fingers. There are also tools called part retrievers that are specifically designed for this task. Do not scratch or hit any components when using these tools. A computer technician needs proper tools to work safely and prevent damage to the computer equipment. A technician uses many tools to diagnose and repair computer problems: Various specialty tools, such as Torx bits, antistatic bags and gloves, and integrated circuit pullers, can be used to repair and maintain computers. Always avoid magnetized tools, such as screwdrivers with magnetic heads, or tools that use extension magnets to retrieve small metal objects that are out of reach. Using magnetic tools can cause loss of data on hard drives and floppy disks. Magnetic tools can also induce current, which can damage internal computer components.

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Hand Tools (2.2.4.3) continued… Component Retrieving Tools • Straight-head screwdriver, large and small • Phillips-head screwdriver, large and small • Tweezers or part retriever • Needle-nosed pliers • Wire cutters • Chip extractor • Hex wrench set • Torx screwdriver • Nut driver, large and small • Three-claw component holder • Wire stripper • Crimper • Punch-down tool • Digital multimeter • Wrap plugs • Small mirror • Small dust brush • Soft, lint-free cloth • Cable ties • Scissors • Small flashlight • Electrical tape • Pencil or pen • Compressed air	Hand Tools continued...see above

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Item	Notes
Hand Tools (2.2.4.3) continued… Various specialty tools, such as Torx bits and integrated circuit pullers, can be used to repair and maintain computers. Always avoid magnetized tools, such as screwdrivers with magnetic heads, or tools that use extension magnets to retrieve small metal objects that are out of reach. Using magnetic tools can cause loss of data on hard drives and floppy disks. Magnetic tools can also induce current, which can damage internal computer components. Additionally, there are specialized testing devices used to diagnose computer and cable problems: • Multimeter: A device that measures AC/DC voltage, electric current, and other cable and electrical characteristics. • Power supply tester: A device that checks whether the computer power supply is working properly. A simple power supply tester might just have indicator lights, while more advanced versions show the amount of voltage and amperage. • Cable tester: A device that checks for wiring shorts or faults, such as wires connected to the wrong pin. • Loopback plug: A device that connects to a computer, hub, switch, or router port to perform a diagnostic procedure called a loopback test. In a loopback test, a signal is transmitted through a circuit and then returned to the sending device to test the integrity of the data transmission. Use a Multimeter and a Power Supply Tester IT Essentials: PC Hardware and Software Lab Manual, Fifth Edition. Testing UTP Cables Using a Loopback Plug and a Cable Meter use a loopback plug and a cable meter to test an Ethernet cable.	Hand Tools continued...see above

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Cleaning Materials (2.2.4.6) *Computer Cases and Monitors Clean computer cases and the outside of monitors with a mild cleaning solution on a damp, lint-free cloth. Mix one drop of dishwashing liquid with 4 oz (118 ml) of water to create the cleaning solution. If water drips inside the case, allow enough time for the liquid to dry before powering on the computer. LCD Screens Do not use ammoniated glass cleaners or any other solution on an LCD screen, unless the cleaner is specifically designed for the purpose. Harsh chemicals damage the coating on the screen. There is no glass protecting these screens, so be gentle when cleaning them and do not press firmly on the screen. CRT Screens To clean the screens of CRT monitors, dampen a soft, clean, lint-free cloth with distilled water and wipe the screen from top to bottom. Then use a soft, dry cloth to wipe the screen and remove streaking. Components Clean dusty components with a can of compressed air. Compressed air does not cause electrostatic buildup on components. Make sure that you are in a well-ventilated area before blowing the dust out of the computer. A best practice is to wear a dust mask to make sure that you do not breathe in the dust particles. Blow out the dust using short bursts from the can. Never tip the can or use the can upside down. Do not allow the fan blades to spin from the force of the compressed air. Hold the fan in place. Fan motors can be ruined from spinning when the motor is not turned on.	When using compressed air to clean inside the computer, blow the air around the components with a minimum distance of 4 in. (10 cm) from the nozzle. Clean the power supply and the fan from the back of the case.
Cleaning Materials (2.2.4.6) Component Contacts Clean the contacts on components with isopropyl alcohol. Do not use rubbing alcohol. Before reinstallation, use compressed air to blow lint off the contacts. Keyboards Clean a desktop keyboard with compressed air and then use a handheld vacuum cleaner with a brush attachment to remove the loose dust.	Cleaning Materials continued…see above

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*Must meet the guidelines for specialized computing equipment as outlined on the "CTE Equipment Guidelines" at www.azed.gov/cte/grants