

# A+ Core Hardware (2003) Examination Objectives

Effective November 26, 2003

## Introduction

For A+ Certification, the examinee must pass both this examination and the A+ Operating System Technologies examination. The Core Hardware examination measures essential competencies for an entry-level IT professional or PC service technician with the equivalent knowledge of at least 500 hours of hands-on experience in the lab or field.

CompTIA recently convened a core of A+ subject matter experts representing a diverse group of IT professionals, which resulted in the revised CompTIA A+ Core Hardware (2003) examination Objectives. The A+ Core Hardware exam will continue to validate that the successful candidate has the important knowledge and skills necessary to competently install, build, configure, upgrade, troubleshoot and repair personal computer compatible hardware including troubleshooting basic network and internet connectivity, dial-up, DSL, and cable. Additionally, the A+ Core Hardware exam will cover the latest memory, bus, peripherals, and wireless technologies.

The skills and knowledge measured by this examination are derived from an industry-level and worldwide critical incident analysis, which was validated through a survey of almost 2,000 A+ certified professionals. The results of the survey are used in weighting the domains and ensuring that the weighting is representative of the relative importance of that content to the job requirements of an entry-level IT professional or PC service technician with the equivalent knowledge of at least 500 hours of hands-on experience in the lab or field. The intent is to certify individuals in a body of knowledge that is identified and accepted as the baseline or foundation of an entry-level IT professional or PC technician. It is not intended to measure 'cutting edge' technologies.

### NOTE:

- September 12<sup>th</sup>, 2003 CompTIA A+ exams in English will continue to test against the 2001 objectives in a conventional (linear, non-adaptive) format and will incorporate items against the 2003 objectives that do not count against the final score.
- **November 26, 2003 A+ exams in English test against the 2003 objectives and the 2001 objectives are retired.**
- This examination blueprint for the A+ Core Hardware examination includes the weighting, test objectives, and example content. Example topics and concepts are included to clarify the test objectives and should not be construed as a comprehensive listing of all the content of this examination.

The table below lists the domains measured by this examination and the extent to which they are represented.

Domain	% Of Examination
1.0 Installation, Configuration and Upgrading	35%
2.0 Diagnosing and Troubleshooting	21%
3.0 Preventive Maintenance	5%
4.0 Motherboard/Processors/Memory	11%
5.0 Printers	9%
6.0 Basic Networking	19%
Total	100.00%

# Domain 1 Installation, Configuration, and Upgrading

## 1.1 Identify the names, purpose, and characteristics, of system modules. Recognize these modules by sight or definition.

Examples of concepts and modules are:

- o Motherboard
- o Firmware
- o Power supply
- o Processor /CPU
- o Memory
- o Storage devices
- o Display devices
- o Adapter cards
- o Ports
- o Cases
- o Riser cards

## 1.2 Identify basic procedures for adding and removing field-replaceable modules for desktop systems. Given a replacement scenario, choose the appropriate sequences.

Desktop components:

- o Motherboard
- o Storage device
  - o FDD
  - o HDD
  - o CD/CDRW
  - o DVD/DVDRW
  - o Tape drive
  - o Removable storage
- o Power supply
  - o AC adapter
  - o AT/ATX
- o Cooling systems
  - o Fans
  - o Heat sinks
  - o Liquid cooling
- o Processor /CPU
- o Memory
- o Display device
- o Input devices
  - o Keyboard
  - o Mouse/pointer devices
  - o Touch screen
- o Adapters
  - o Network Interface Card (NIC)
  - o Sound card
  - o Video card
  - o Modem
  - o SCSI
  - o IEEE 1394/Firewire
  - o USB

- Wireless

**1.3 Identify basic procedures for adding and removing field-replaceable modules for portable systems. Given a replacement scenario, choose the appropriate sequences.**

Portable components:

- Storage devices
  - FDD
  - HDD
  - CD/CDRW
  - DVD/DVDRW
  - Removable storage
- Power sources
  - AC adapter
  - DC adapter
  - Battery
- Memory
- Input devices
  - Keyboard
  - Mouse/pointer devices
  - Touch screen
- PCMCIA/Mini PCI Adapters
  - Network Interface Card (NIC)
  - Modem
  - SCSI
  - IEEE 1394/Firewire
  - USB
  - Storage (memory and hard drive)
- Docking station/port replicators
- LCD panel
- Wireless
  - Adapter/controller
  - Antennae

**1.4 Identify typical IRQs, DMAs, and I/O addresses, and procedures for altering these settings when installing and configuring devices. Choose the appropriate installation or configuration steps in a given scenario.**

Content may include the following:

- Legacy devices (e.g., ISA sound card)
- Specialized devices (e.g., CAD/CAM)
- Internal modems
- Floppy drive controllers
- Hard drive controllers
- Multimedia devices
- NICs
- I/O ports
  - Serial
  - Parallel
  - USB ports
  - IEEE 1394/Firewire
  - Infrared

**1.5 Identify the names, purposes, and performance characteristics, of standardized/common peripheral ports, associated cabling, and their connectors. Recognize ports, cabling, and connectors, by sight.**

Content may include the following:

- o Port types
  - o Serial
  - o Parallel
  - o USB ports
  - o IEEE 1394/Firewire
  - o Infrared
- o Cable types
  - o Serial (Straight through vs. null modem)
  - o Parallel
  - o USB
- o Connector types
  - o Serial
    - DB-9
    - DB-25
    - RJ-11
    - RJ-45
  - o Parallel
    - DB-25
    - Centronics (mini, 36)
  - o PS2/MINI-DIN
  - o USB
  - o IEEE 1394

**1.6 Identify proper procedures for installing and configuring common IDE devices. Choose the appropriate installation or configuration sequences in given scenarios. Recognize the associated cables.**

Content may include the following:

- o IDE Interface Types
  - o EIDE
  - o ATA/ATAPI
  - o Serial ATA
  - o PIO
- o RAID (0, 1 and 5)
- o Master/Slave/cable select
- o Devices per channel
- o Primary/Secondary
- o Cable orientation/requirements

**1.7 Identify proper procedures for installing and configuring common SCSI devices. Choose the appropriate installation or configuration sequences in given scenarios. Recognize the associated cables.**

Content may include the following:

- o SCSI Interface Types
  - o Narrow
  - o Fast

- Wide
- Ultra-wide
- LVD
- HVD
- Internal versus external
- SCSI IDs
  - Jumper block/DIP switch settings (binary equivalents)
  - Resolving ID conflicts
- RAID (0, 1 and 5)
- Cabling
  - Length
  - Type
  - Termination requirements (active, passive, auto)

**1.8 Identify proper procedures for installing and configuring common peripheral devices. Choose the appropriate installation or configuration sequences in given scenarios.**

Content may include the following:

- Modems and transceivers (dial-up, cable, DSL, ISDN)
- External storage
- Digital cameras
- PDAs
- Wireless access points
- Infrared devices
- Printers
- UPS (Uninterruptible Power Supply) and suppressors
- Monitors

**1.9 Identify procedures to optimize PC operations in specific situations. Predict the effects of specific procedures under given scenarios.**

Topics may include:

- Cooling systems
  - Liquid
  - Air
  - Heat sink
  - Thermal compound
- Disk subsystem enhancements
  - Hard drives
  - Controller cards (e.g., RAID, ATA-100, etc.)
  - Cables
- NICs
- Specialized video cards
- Memory
- Additional processors

**1.10 Determine the issues that must be considered when upgrading a PC. In a given scenario, determine when and how to upgrade system components.**

Issues may include:

- Drivers for legacy devices

- o Bus types and characteristics
- o Cache in relationship to motherboards
- o Memory\_capacity and characteristics
- o Processor speed and compatibility
- o Hard drive\_capacity and characteristics
- o System/firmware limitations
- o Power supply output capacity

Components may include the following:

- o Motherboards
- o Memory
- o Hard drives
- o CPU
- o BIOS
- o Adapter cards
- o Laptop power sources
  - o Lithium ion
  - o NiMH
  - o Fuel cell
- o PCMCIA Type I, II, III cards

## Domain 2 Diagnosing and Troubleshooting

### **2.1 Recognize common problems associated with each module and their symptoms, and identify steps to isolate and troubleshoot the problems. Given a problem situation, interpret the symptoms and infer the most likely cause.**

Content may include the following:

- o I/O ports and cables
  - o Serial
  - o Parallel
  - o USB ports
  - o IEEE 1394/Firewire
  - o Infrared
  - o SCSI
- o Motherboards
  - o CMOS/ BIOS settings
  - o POST audible/visual error codes
- o Peripherals
- o Computer case
  - o Power supply
  - o Slot covers
  - o Front cover alignment
- o Storage devices and cables
  - o FDD
  - o HDD
  - o CD/CDRW
  - o DVD/DVDRW
  - o Tape drive
  - o Removable storage
- o Cooling systems
  - o Fans
  - o Heat sinks
  - o Liquid cooling
  - o Temperature sensors
- o Processor /CPU
- o Memory
- o Display device
- o Input devices
  - o Keyboard
  - o Mouse/pointer devices
  - o Touch screen
- o Adapters
  - o Network Interface Card (NIC)
  - o Sound card
  - o Video card
  - o Modem
  - o SCSI
  - o IEEE 1394/Firewire
  - o USB
- o Portable Systems
  - o PCMCIA
  - o Batteries

- Docking Stations/Port Replicators
- Portable unique storage

## **2.2 Identify basic troubleshooting procedures and tools, and how to elicit problem symptoms from customers. Justify asking particular questions in a given scenario.**

Content may include the following:

- Troubleshooting/isolation/problem determination procedures
- Determining whether a hardware or software problem
- Gathering information from user
  - Customer Environment
  - Symptoms/Error Codes
  - Situation when the problem occurred

## **Domain 3 PC Preventive Maintenance, Safety, and Environmental Issues**

### **3.1 Identify the various types of preventive maintenance measures, products and procedures and when and how to use them.**

Content may include the following:

- Liquid cleaning compounds
- Types of materials to clean contacts and connections
- Non-static vacuums (chassis, power supplies, fans)
- Cleaning monitors
- Cleaning removable media devices
- Ventilation, dust and moisture control on the PC hardware interior.
- Hard disk maintenance (defragging, scan disk, CHKDSK)
- Verifying UPS (Uninterruptible Power Supply) and suppressors

### **3.2 Identify various safety measures and procedures, and when/how to use them.**

Content may include the following:

- ESD (Electrostatic Discharge) precautions and procedures
  - What ESD can do, how it may be apparent, or hidden
  - Common ESD protection devices
  - Situations that could present a danger or hazard
- Potential hazards and proper safety procedures relating to
  - High-voltage equipment
  - Power supply
  - CRTs

### **3.3 Identify environmental protection measures and procedures, and when/how to use them.**

Content may include the following:

- Special disposal procedures that comply with environmental guidelines.

- o Batteries
- o CRTs
- o Chemical solvents and cans
- o MSDS (Material Safety Data Sheet)

## Domain 4 Motherboard/Processors/Memory

### 4.1 Distinguish between the popular CPU chips in terms of their basic characteristics.

Content may include the following:

- o Popular CPU chips (Pentium class compatible)
- o Voltage
- o Speeds (actual vs. advertised)
- o Cache level I, II, III
- o Sockets/slots
- o VRM(s)

### 4.2 Identify the types of RAM (Random Access Memory), form factors, and operational characteristics. Determine banking and speed requirements under given scenarios.

Content may include the following:

- o Types
  - o EDO RAM (Extended Data Output RAM)
  - o DRAM (Dynamic Random Access Memory)
  - o SRAM (Static RAM)
  - o VRAM (Video RAM)
  - o SDRAM (Synchronous Dynamic RAM)
  - o DDR (Double Data Rate)
  - o RAMBUS
- o Form factors (including pin count)
  - o SIMM (Single In-line Memory Module)
  - o DIMM (Dual In-line Memory Module)
  - o SoDIMM (Small outline DIMM)
  - o MicroDIMM
  - o RIMM
- o Operational characteristics
  - o Memory chips (8-bit, 16-bit, and 32-bit)
  - o Parity chips versus non-parity chips
  - o ECC vs. non-ECC
  - o Single-sided vs. double sided

### 4.3 Identify the most popular types of motherboards, their components, and their architecture (bus structures).

Content may include the following:

- o Types of motherboards:
  - o AT
  - o ATX
- o Components:
  - o Communication ports

- Serial
- USB
- Parallel
- IEEE 1394/Firewire
- Infrared
- Memory
  - SIMM
  - DIMM
  - RIMM
  - SoDIMM
  - MicroDIMM
- Processor sockets
  - Slot 1
  - Slot 2
  - Slot A
  - Socket A
  - Socket 7
  - Socket 8
  - Socket 423
  - Socket 478
  - Socket 370
- External cache memory (Level 2)
- Bus Architecture
- ISA
- PCI
  - PCI 32-bit
  - PCI 64-bit
- AGP
  - 2X
  - 4X
  - 8X (Pro)
- USB (Universal Serial Bus)
- AMR (audio modem riser) slots
- CNR (communication network riser) slots
- Basic compatibility guidelines
- IDE (ATA, ATAPI, ULTRA-DMA, EIDE)
- SCSI (Narrow, Wide, Fast, Ultra, HVD, LVD(Low Voltage Differential))
- Chipsets

#### **4.4 Identify the purpose of CMOS (Complementary Metal-Oxide Semiconductor) memory, what it contains, and how and when to change its parameters. Given a scenario involving CMOS, choose the appropriate course of action.**

CMOS Settings:

- Default settings
- CPU settings
- Printer parallel port—Uni., bi-directional, disable/enable, ECP, EPP
- COM/serial port—memory address, interrupt request, disable
- Floppy drive—enable/disable drive or boot, speed, density
- Hard drive—size and drive type
- Memory—speed, parity, non-parity
- Boot sequence
- Date/Time
- Passwords

- o Plug & Play BIOS
- o Disabling on-board devices
- o Disabling virus protection
- o Power management
- o Infrared

## Domain 5 Printers

### 5.1 Identify printer technologies, interfaces, and options/upgrades.

Technologies include:

- o Laser
- o Ink Dispersion
- o Dot Matrix
- o Solid ink
- o Thermal
- o Dye sublimation

Interfaces include:

- o Parallel
- o Network
- o SCSI
- o USB
- o Infrared
- o Serial
- o IEEE 1394/Firewire
- o Wireless

Options/Upgrades include:

- o Memory
- o Hard drives
- o NICs
- o Trays and feeders
- o Finishers (e.g., stapling, etc.)
- o Scanners/fax/copier

### 5.2 Recognize common printer problems and techniques used to resolve them.

Content may include the following:

- o Printer drivers
- o Firmware updates
- o Paper feed and output
- o Calibrations
- o Printing test pages
- o Errors (printed or displayed)
- o Memory
- o Configuration
- o Network connections
- o Connections
- o Paper jam
- o Print quality

- o Safety precautions
- o Preventive maintenance
- o Consumables
- o Environment

## Domain 6 Basic Networking

### 6.1 Identify the common types of network cables, their characteristics and connectors.

Cable types include:

- o Coaxial
  - o RG6
  - o RG8
  - o RG58
  - o RG59
- o Plenum/PVC
- o UTP
  - o CAT3
  - o CAT5/e
  - o CAT6
- o STP
- o Fiber
  - o Single-mode
  - o Multi-mode

Connector types include:

- o BNC
- o RJ-45
- o AUI
- o ST/SC
- o IDC/UDC

### 6.2 Identify basic networking concepts including how a network works.

Concepts include:

- o Installing and configuring network cards
- o Addressing
- o Bandwidth
- o Status indicators
- o Protocols
  - o TCP/IP
  - o IPX/SPX (NWLINK)
  - o AppleTalk
  - o NETBEUI/NETBIOS
- o Full-duplex, half-duplex
- o Cabling—Twisted Pair, Coaxial, Fiber Optic, RS-232
- o Networking models
  - o Peer-to-peer
  - o Client/server
- o Infrared

- o Wireless

### **6.3 Identify common technologies available for establishing Internet connectivity and their characteristics.**

Technologies include:

- o LAN
- o DSL
- o Cable
- o ISDN
- o Dial-up
- o Satellite
- o Wireless

Characteristic include:

- o Definition
- o Speed
- o Connections