

HARDWARE DIAGNOSTICS & TROUBLESHOOTING GUIDE

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SECTION 1: DISPLAY & MONITOR ISSUES

SYMPTOMS:

- Blank or black screen
- Flickering display
- Distorted or garbled image
- Wrong resolution or colors
- Monitor not detected

ROOT CAUSES:

1. Loose or damaged video cable
2. Faulty graphics card or driver
3. Monitor power or backlight failure
4. Incorrect display settings
5. Hardware incompatibility

TROUBLESHOOTING STEPS:

Step 1: Check Physical Connections

- Verify video cable is securely connected at both ends
- Check cable for visible damage (bent pins, fraying)
- Try different video cable if available
- Test different video port (HDMI, DisplayPort, VGA)
- Ensure monitor power cable is connected

Step 2: Test Monitor Independently

- Connect monitor to different device
- Verify monitor works with other source
- Check monitor on-screen display (OSD) menu
- Test monitor with different cable
- If monitor fails on all devices, monitor is faulty

Step 3: Update Graphics Driver

- Check current graphics driver version
- Download latest driver from manufacturer
- Uninstall old driver completely
- Install new driver
- Restart device after driver installation

Step 4: Check Display Settings

- Access display settings (right-click desktop > Display Settings)
- Verify correct monitor is selected
- Check resolution matches monitor native resolution
- Test different refresh rates
- Reset display settings to default

Step 5: Test Graphics Card

- Check graphics card is properly seated in slot
- Verify graphics card power connectors
- Test with integrated graphics if available
- Check graphics card temperature (overheating)
- Replace graphics card if hardware failure

AUTOMATED RESOLUTION:

- Script: test-display-hardware.ps1
- Command: Test-DisplayAdapter -AdapterName "NVIDIA"
- Verification: Get-DisplayConfiguration

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SECTION 2: KEYBOARD & MOUSE PROBLEMS

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SYMPTOMS:

- Keys not responding
- Mouse cursor not moving
- Intermittent input issues
- Wrong characters typed
- Input device not recognized

ROOT CAUSES:

1. USB port failure
2. Driver issues
3. Physical damage to device
4. Wireless connectivity problems
5. Power/battery issues (wireless devices)

TROUBLESHOOTING STEPS:

Step 1: Check USB Connection

- Try different USB port
- Test USB port with other device
- Check USB cable for damage
- Try USB 2.0 port if using USB 3.0
- Verify USB port is not disabled in BIOS

Step 2: Test Device on Different Computer

- Connect keyboard/mouse to different device
- Verify device works on other computer
- If works elsewhere, issue is with original device
- If fails on both, device is likely faulty
- Note which device has the problem

Step 3: Update Input Device Drivers

- Open Device Manager
- Locate keyboard/mouse under "Keyboards" or "Mice"
- Right-click > Update driver
- Search automatically for drivers
- Restart device after driver update

Step 4: Check Wireless Connectivity (If Applicable)

- Verify wireless receiver is connected
- Check receiver is within range
- Replace batteries in wireless device
- Re-sync wireless device with receiver
- Check for interference from other devices

Step 5: Clean Input Device

- Power off device
- Clean keyboard keys with compressed air
- Remove keycaps and clean underneath (if mechanical)
- Clean mouse sensor with lint-free cloth
- Check for stuck keys or buttons

AUTOMATED RESOLUTION:

- Script: test-input-devices.ps1
- Command: Test-KeyboardMouse -DeviceType "USB"
- Verification: Get-InputDeviceStatus

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SECTION 3: STORAGE DEVICE FAILURES
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SYMPTOMS:

- "Disk not found" errors
- Slow read/write speeds
- Corrupted files or data loss
- Drive not appearing in system
- Clicking or grinding noises (HDD)

ROOT CAUSES:

1. Failing or failed storage device
2. Loose SATA/power cables
3. File system corruption
4. Bad sectors on drive
5. Overheating storage device

TROUBLESHOOTING STEPS:

Step 1: Check Physical Connections

- Power off device completely
- Verify SATA data cable is connected
- Check power cable to drive
- Reseat both cables firmly
- Test with different cables if available

Step 2: Check Drive in BIOS/UEFI

- Boot into BIOS/UEFI settings
- Navigate to storage/SATA configuration
- Verify drive is detected in BIOS
- Check drive appears in boot order
- Note drive model and capacity

Step 3: Run Disk Diagnostics

Windows:

- Open Command Prompt as Administrator
- Run: `chkdsk C: /f /r` (replace C: with drive letter)
- Allow scan to complete (may take hours)
- Review scan results for errors

macOS:

- Open Disk Utility
- Select drive
- Click "First Aid"
- Review repair results

Step 4: Check Drive Health

- Use manufacturer diagnostic tools:
 - * Seagate: SeaTools
 - * Western Digital: WD Diagnostics
 - * Samsung: Samsung Magician
- Run full diagnostic scan
- Review SMART status
- Check for bad sectors

Step 5: Backup and Replace Drive

- Backup all important data immediately
- Use drive cloning software if drive still accessible
- Replace failing drive with new drive
- Restore data from backup
- Verify new drive functions correctly

AUTOMATED RESOLUTION:

- Script: `test-storage-health.ps1`
- Command: `Get-DiskHealth -DriveLetter "C"`
- Verification: `Test-DiskIntegrity`

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SECTION 4: MEMORY (RAM) PROBLEMS
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SYMPTOMS:

- System crashes or blue screens
- Random application errors
- System instability
- Memory-related error messages
- Computer won't boot

ROOT CAUSES:

1. Faulty RAM module
2. RAM not properly seated
3. Incompatible RAM modules
4. Overheating RAM
5. Memory slot failure

TROUBLESHOOTING STEPS:

Step 1: Run Memory Diagnostic

Windows:

- Open Windows Memory Diagnostic
- Restart and run test
- Review results after restart
- Note any errors reported

Third-party tools:

- MemTest86 (bootable USB)
- Run extended memory test
- Let test run for multiple passes
- Document any errors found

Step 2: Check RAM Installation

- Power off and unplug device
- Open case and locate RAM modules
- Verify RAM is fully seated in slots
- Check for visible damage
- Reseat RAM modules firmly

Step 3: Test Individual RAM Modules

- Remove all but one RAM module
- Boot system and test
- If works, add modules one at a time
- Identify which module causes issues
- Replace faulty module

Step 4: Verify RAM Compatibility

- Check motherboard RAM specifications
- Verify RAM speed matches requirements
- Ensure RAM type is correct (DDR3/DDR4/DDR5)
- Check maximum supported capacity
- Review RAM voltage requirements

Step 5: Check for Overheating

- Monitor RAM temperature if possible
- Ensure adequate case ventilation
- Check RAM heat spreaders are attached
- Clean dust from RAM and surrounding area
- Improve case airflow if needed

AUTOMATED RESOLUTION:

- Script: test-memory.ps1
- Command: Test-Memory -TestType Extended
- Verification: Get-MemoryStatus

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SECTION 5: POWER SUPPLY & OVERHEATING ISSUES

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SYMPTOMS:

- System shuts down unexpectedly
- Computer won't power on
- Random reboots
- Overheating warnings
- Fan noise or failure

ROOT CAUSES:

1. Insufficient or failing power supply
2. Overheating components
3. Fan failure or blockage
4. Power supply overload
5. Thermal paste degradation

TROUBLESHOOTING STEPS:

Step 1: Check Power Supply

- Verify power supply is adequate wattage
- Check power supply fan is spinning
- Listen for unusual noises (grinding, clicking)
- Test with known good power supply if available
- Check power supply voltage outputs with multimeter

Step 2: Monitor System Temperatures

- Use temperature monitoring software:
 - * HWMonitor
 - * Core Temp
 - * SpeedFan
- Check CPU, GPU, and system temperatures
- Verify temperatures are within safe ranges
- Note which components are overheating

Step 3: Check Fan Operation

- Verify all case fans are spinning
- Check CPU and GPU fans are working
- Clean dust from fans and heatsinks
- Replace non-functioning fans
- Ensure fans are properly connected

Step 4: Improve Airflow

- Remove dust from case interior
- Clean air filters if present
- Ensure cables are not blocking airflow
- Verify case has adequate ventilation
- Consider adding additional case fans

Step 5: Reapply Thermal Paste (CPU/GPU)

- Remove CPU/GPU heatsink carefully
- Clean old thermal paste completely
- Apply new thermal paste (pea-sized amount)
- Reattach heatsink securely
- Monitor temperatures after reapplication

AUTOMATED RESOLUTION:

- Script: monitor-system-health.ps1
- Command: Get-SystemTemperature -Component "CPU"
- Verification: Test-PowerSupply -LoadTest

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SECTION 6: MOTHERBOARD & BOOT ISSUES

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SYMPTOMS:

- Computer won't boot
- POST (Power-On Self-Test) errors
- Beep codes on startup
- System hangs during boot
- Hardware not detected

ROOT CAUSES:

1. Motherboard failure
2. BIOS/UEFI configuration errors
3. CMOS battery failure
4. Hardware component failure
5. Boot device issues

TROUBLESHOOTING STEPS:

Step 1: Check POST and Beep Codes

- Listen for beep codes during boot
- Count number and pattern of beeps
- Refer to motherboard manual for beep code meanings
- Document beep code pattern
- Research beep code interpretation

Step 2: Reset BIOS/UEFI Settings

- Access BIOS/UEFI during boot (usually F2, F10, or Del)
- Locate "Load Default Settings" or "Reset to Defaults"
- Save and exit BIOS
- Test if system boots after reset
- Reconfigure BIOS settings if needed

Step 3: Check CMOS Battery

- Locate CMOS battery on motherboard
- Check battery voltage (should be ~3V)
- Replace battery if voltage is low
- Reset BIOS after battery replacement
- Verify system date/time after replacement

Step 4: Minimal Hardware Test

- Disconnect all non-essential hardware
- Boot with only:
 - * CPU
 - * One RAM module
 - * Power supply

- * Motherboard
- Add components one at a time
- Identify which component causes issue

Step 5: Visual Inspection

- Check motherboard for:
 - * Bulging or leaking capacitors
 - * Burn marks or discoloration
 - * Loose or damaged components
 - * Corrosion or moisture damage
- Document any visible damage
- Replace motherboard if damaged

AUTOMATED RESOLUTION:

- Script: test-motherboard.ps1
- Command: Test-MotherboardHealth -FullTest
- Verification: Get-BIOSStatus

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ESCALATION CRITERIA

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Escalate to Hardware Support if:

- Component replacement required
- Motherboard failure suspected
- Data recovery needed from failed drive
- Warranty claim processing
- Complex hardware configuration issues

Contact Information:

- Hardware Support: hardware@company.com
- Warranty Claims: warranty@company.com
- On-site Support: Check service portal
- Emergency: 1-800-HARDWARE

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