

Pre-order Letter & FAQ

Model: CW-W680

CWWK Official Store

Version 1.1 (2025.11)

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Pre-order Letter (English)

Dear Customer,

Thank you very much for choosing our CWWK product.

Here are some helpful tips:

We offer 1 year warranty and lifetime online technical support for free. If you have any questions, you can always contact us by email or via Amazon's buyer-seller messaging system, we will reply within 24 hours.

Product manuals, drivers, BIOS update files, and other resources will be updated on the MEGA Cloud Drive. The link:

<https://mega.nz/folder/tR1EDb7Q#5vR7velSxGhfNZFLgJSbQg>

For ECC Memory, we recommend choosing Crucial (Micron), Kingston, Samsung or Hynix (SK Hynix).

- The CWWK W680 supports **ECC UDIMM (unbuffered)**. Before purchasing, make sure to choose **Unbuffered ECC** and **do not buy RDIMM (Registered ECC)**.
- Try to use memory sticks that are **from the same brand, same capacity, and same batch** to ensure full ECC functionality.
- DDR5 memory at **5600MHz** requires a **13th Gen Intel Core i7 or higher CPU**. 12th Gen CPUs only support up to **4800MHz**.
- Memory Frequency by Channel: **Single-channel**: up to **5600MHz**; **Dual-channel**: drops to **5200MHz**; **Four-channel**: drops to **4200-4800MHz**.
- When installing memory, strictly follow the rules below:

	DIMM A1	DIMM A2	DIMM B1	DIMM B2
1 x DDR5				✓
2 x DDR5		✓		✓
4 x DDR5	✓	✓	✓	✓

- **For detailed Debug LED error codes, please refer to Appendix A of this document.**

For more solutions to product-related questions, please refer to the FAQ.

Best regards,

CWWK Official Store

FAQ (English)

Q: Why can't I find any tracking information with the tracking number? Is the number correct?

A: This is because DHL (or another carrier) has not yet pick up the package, so no tracking updates are available at the moment. For some models, or when RAM or SSDs are out of stock in our European warehouse, the shipment will be sent from our China warehouse. Tracking details with DHL will only appear after the goods arrive in Germany and are handed over to DHL. For the shipment from China to Germany, if you would like to know the current location of your package, please feel free to contact us and we will check it for you.

Q: Does the motherboard support "K" series CPUs, such as 14600K or 14900K? Which CPUs are recommended?

A: The motherboard **does support "K" series CPUs**, but it is **not recommended** because the board is primarily designed for NAS usage, running 24/7. It is more suitable for low-power "T" series CPUs. Our recommended choice is the **i5-13500T** or other 13th/14th generation low-power "T" CPUs.

Generation	Model	Cores/Threads	TDP (W)	Base Frequency (GHz)	Max Turbo (GHz)	vPro	vPro Supported
12th	i5-12600T	10C/16T (6P+4E)	35	2.3	4.6	✓	✓
12th	i7-12700T	12C/20T (8P+4E)	35	2.0	4.7	✓	✓
12th	i9-12900T	16C/24T (8P+8E)	35	1.9	4.9	✓	✓
13th	i5-13600T	10C/16T (6P+4E)	35	2.6	4.8	✓	✓
13th	i7-13700T	12C/20T (8P+4E)	35	2.2	5.0	✓	✓

13th	i9-13900T	24C/32T (8P+16E)	35 / 106	P=2.1, E=1.5	5.1 (P-core)	✓	✓
14th	i5-14600T	10C/16T (6P+4E)	35 / 106	P=2.6, E=1.7	4.9 (P-core)	✓	✓
14th	i7-14700T	12C/20T (8P+4E)	35 / 106	P=2.2, E=1.7	5.1 (P-core)	✓	✓
14th	i9-14900T	24C/32T (8P+16E)	35 / 106	P=1.1, E=0.8	5.5 (P-core), 4.0 (E-core)	✓	✓

Q: The idle power consumption is too high. Are there BIOS options to reduce it?

A:

Yes. CWWK BIOS includes 4 main power-saving options.

Please note that **available options may vary depending on the model and BIOS version.**

1. PL1 / PL2 (CPU Power Limits)

Control CPU power draw and performance balance.

- **PL1:** Long-term sustained power limit (e.g., 15W TDP).
- **PL2:** Short-term boost limit for higher performance under load.

To enable:

 Tutorial: <https://doc.x86pi.cn/#/docs/fs/VXCQuW3XQSoSL8RRJL2ixp/173>

2. ASPM (Active State Power Management)

Reduces PCIe lane voltage/clock when idle.

Modes: **L0s (light saving)**, **L1 (deep saving)**.

3. C-State (CPU Idle States)

Automatically lowers CPU power when idle.

Levels: **C0 (active)** → **C10 (deep sleep)**.

4. ACPI (Advanced Configuration and Power Interface)

Defines system-wide power states:

S0 (on), S3 (sleep), S4 (hibernate), S5 (off).

Available under **Advanced → ACPI Settings**.

Q: The Motherboard won't turn on, how can I troubleshoot it?

A: The product has undergone a power-on test before packaging and shipping, so the likelihood of hardware failure preventing it from powering on is very low. You can troubleshoot using the following methods.

1. This motherboard model comes with a Debug LED. You can refer to the code table in Appendix A to quickly identify the issue.
2. After pressing the power button on the case, the motherboard shows no response. Please refer to the F_PANEL pin layout indicated on the motherboard and in the product manual to ensure that the case's power switch is connected correctly.
3. It is common for customers to connect only the 24-pin power connector and forget to connect the 8-pin (4-pin) CPU power connector. Please make sure the 8-pin (4-pin) CPU power connector is properly connected.
4. Verify that the power supply specifications meet the motherboard's requirements. (At least a 250W power supply is required to boot the system without any SATA HDDs installed, and at least a 500W power supply is recommended for full load with all drives installed.)
5. You can troubleshoot by using the beep codes. If no memory is installed or the memory is not seated properly, the motherboard will emit 5 continuous beeps. After installing the memory, the motherboard will take some time to detect it, and if the POST self-test passes normally, you will hear only one beep.
6. Clean the memory modules and reseat them, or try different ones. Memory modules may have compatibility issues due to differences in timing, production batches, and other factors. Even the 4 recommended brands cannot be guaranteed to be 100% compatible. If possible, we suggest trying memory modules from different brands to find the most suitable one.
7. Clear the CMOS (BIOS reset) to troubleshoot BIOS issues and problems caused by static electricity buildup. Please remove the CMOS battery from the motherboard

about 5-10 min, to perform the reset. After the CMOS has been successfully cleared, reinstall the battery.

8. Alternatively, refer to the pin definition manual to locate the CMOS-clear jumper and short the pins to clear the CMOS. If the system fails to boot due to a BIOS update failure, you can use the BIOS reset button (located next to the USB-C port) to restore the BIOS.

Q: No HDMI or DP Display After Startup.

A:

1. If you are using an F-series CPU, it does not have integrated graphics, so a discrete GPU is required for display output.
2. If you have installed a discrete graphics card, please connect the monitor cable to the discrete GPU. If not, proceed to the next step.
3. Check if the monitor is powered on. Ensure the monitor cables are functioning properly. Especially when the monitor uses a signal conversion adapter, please ensure that the connection direction of the HDMI or DP cable is correct, as these cables are not truly bidirectional.
4. If you are using a non-standard PC monitor—such as a TV or a high-end display with multi-frequency output options—you may need to adjust the output settings in the TV or monitor's menu. Try lowering the output resolution or switching to a compatibility mode to better match the integrated graphics.
5. Check if the display modules have the necessary drivers installed.

Q: The memory frequency cannot reach 5600 MHz; it can only go up to 4800 MHz or 5200 MHz.

A:

1. The 5600 MHz memory speed is quite challenging—it requires perfect compatibility between the RAM, motherboard, and CPU to reach 5600 MHz.
2. If all memory slots are populated, it is almost impossible to reach the full speed. On a 4-slot motherboard, the speed will most likely auto-negotiate between 4200–4800 MHz.
3. Can you force the memory to 5600 MHz? Some motherboards allow setting the memory frequency manually, but in most cases, forcing the speed will not work—unless the motherboard and memory support XMP.

Q: How to enable Intel RST/VMD to implement NVMe RAID functionality?

A:

During boot, continuously press the **Delete** key to enter BIOS → **Chipset** → **System Agent (SA) Configuration** → **Graphics Configuration** → **Yellow Screen Workaround** → press **Enter**, in the pop-up menu change it to **Enabled**, then press **ESC** once to return to **System Agent (SA) Configuration**. You will now see an additional line **VMD setup menu** under **Graphics Configuration**. Press **Enter** again and set it to **Enabled**.

Finally, press **F10** and then **Enter** to save and reboot.

After enabling VMD, the existing system may fail to boot and show a **0X00007B blue screen**.

1. In PE, use **DISM++** to inject the VMD driver into the system. After reboot, the system will work normally.
 2. Reinstall the system. During installation, if the system hasn't been preconfigured, it may not have the VMD driver. Prepare the VMD driver in advance and load it when detecting the drives, then proceed with normal installation.
- Supports RAID levels: **RAID0 / RAID1 / RAID5 / RAID10**
 - Compatible with 11th and 13th generation Intel CPUs

After downloading Intel RST/VMD

(<https://mega.nz/folder/hMN2QTIQ#hWXI5BOVPAQzq6EtQzEXXA>), extract the VMD driver using:

./SetupRST.exe -extractdrivers SetupRST_extracted

Wait for it to finish. A new directory **SetupRST_extracted** will appear containing the drivers.

Q: Does the SFF-8643 port support 4 NVMe signals?

A:

No, it does not. It only supports conversion to 4 SATA 3.0 signals via an appropriate adapter cable.

Q: Unable to Enter System or Detect Hard Drive.

A:

1. Confirm that the hard drive power and data cables are connected properly.
2. Check for any damage to the hard drive.
3. Ensure the operating system is properly installed on the hard drive.
4. Verify that the hard drive is seated correctly.
5. Check if the motherboard supports the hard drive mode. Since only UEFI mode is supported, please make sure the hard drive is partitioned using GPT, not MBR.

Q: Blue Screen or Freeze During System Boot

A:

1. Check for loose memory modules or external cards.
2. Remove newly installed hardware and uninstall recent drivers or software.
3. Try different memory modules.
4. Since this model only supports UEFI mode, selecting Legacy mode during system installation may cause the system to freeze.

Q: System Automatically Restarts

A:

1. Try different memory modules.
2. Remove all peripherals if they are being recognized as boot devices, and test with another monitor.

Q: Stuck on BIOS Screen During Boot

A:

1. Ensure the CPU cooling fan is functioning properly.
2. Check for loose memory modules or external cards.
3. Verify that the power supply can handle the power requirements; consider trying a different power supply.

Q: Unable to Detect USB Device.

A:

1. Check if the USB device requires separate power
2. Ensure USB ports are not experiencing connection issues
3. Verify that the USB controller is enabled in BIOS Setup

Q: The network port is not recognized, what should I do?

A:

1. Please connect the network cable first, then connect the power.
2. Make sure the network card is recognized in Device Manager. If it is not detected, the driver may not be properly installed.
3. Check whether there is a possible short circuit between the motherboard and the case. Place the motherboard on an insulated box or table for testing. Remove the heatsink from the network card and test again.

Q: Which OS are supported by this NAS motherboard?

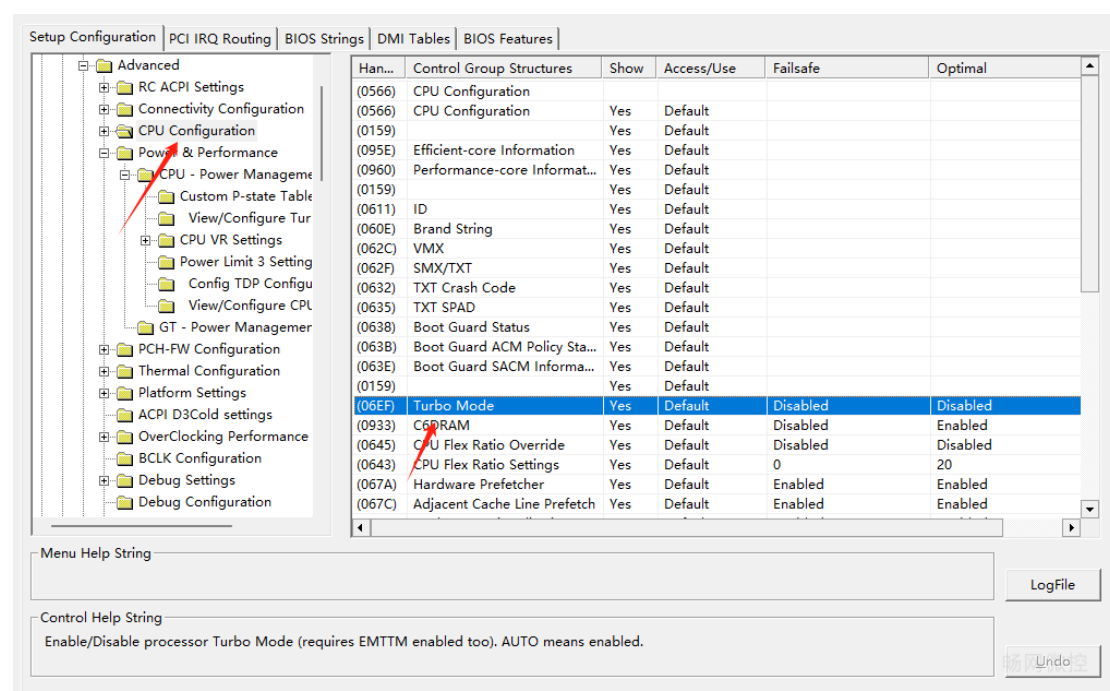
A:

TrueNAS, Unraid, OpenMediaVault, PVE, Windows, Linux, etc.

Q: If want to build a pure NAS and aim to reduce power consumption, what methods can be used?

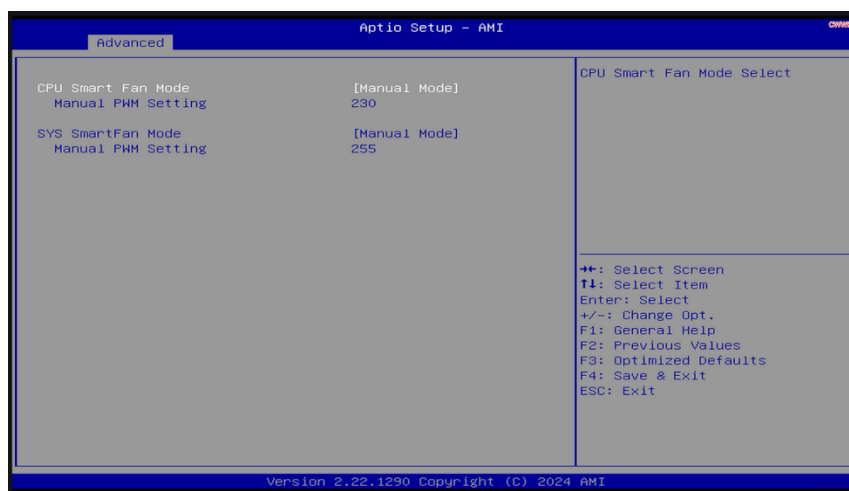
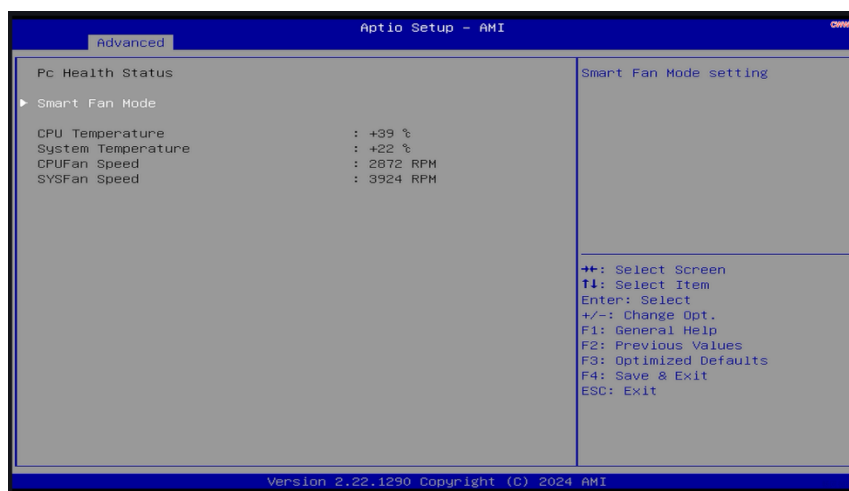
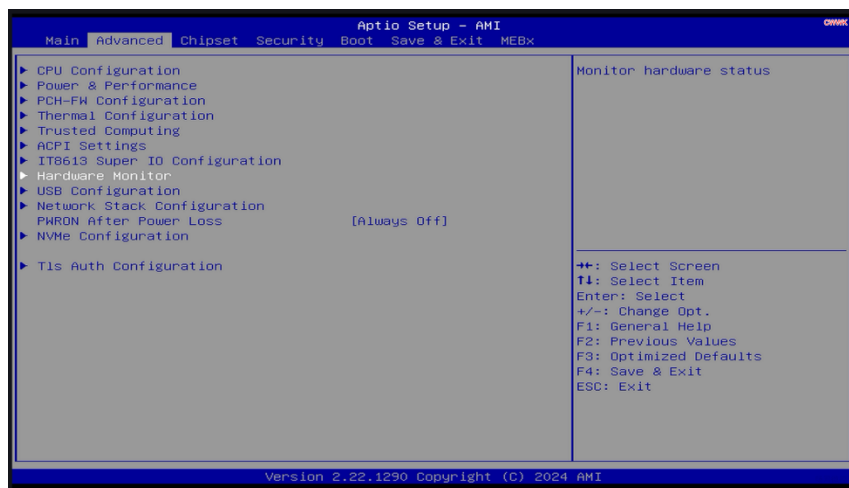
A: During boot, continuously press the **Delete** key to enter **BIOS** → **Chipset** → **System Agent (SA) Configuration** → **Graphics Configuration** → **Yellow Screen Workaround** → press **Enter** and set it to **Enabled**.

After enabling **Yellow Screen Workaround**, a **Power** option will appear under the **Advanced** menu. In this menu, you can adjust **L1/L2 settings** and also **disable Turbo Mode** to further reduce power consumption.



Q: How to adjust the CPU/SYS fan speeds?

A: During boot, continuously press the **Delete** key to enter **BIOS** → **Advanced** → **Hardware Monitor**.



Manual Mode / Static Mode

- Manual PWM Setting can be set from 0–255, where 0 is the minimum and 255 is the maximum.

For example, if you have set it to 255 but the fan speed is still below 2000 RPM, you may need to replace the fan with one that has a higher maximum RPM, such as a 3500 RPM or 4000 RPM fan.

Example with a 4000 RPM fan:

- Setting 63 → 25% speed → approximately 1000 RPM
- Setting 127 → 50% speed → approximately 2000 RPM
- Setting 191 → 75% speed → approximately 3000 RPM
- Setting 255 → 100% speed → 4000 RPM

After making the settings, be sure to save and restart the BIOS.

Q: Update the wrong BIOS — how to recover?

A:

Try resetting the BIOS by clearing the CMOS (Jumper and BIOS recovery button). If clearing the CMOS does not work, you will need to reflash the correct BIOS using a programmer. The instructions for using the programmer and the BIOS flashing guide are available upon request. Please contact us to obtain them.

Appendix A

Debug LED Seven-Segment Diagnostic Code Table – Common AMI BIOS/UEFI POST Codes (including B2, B5, 55, 95, etc.)

The following is a more complete and practical reference table of common AMI (Aptio V) UEFI diagnostic codes, suitable for most CWWK motherboards using AMI firmware (such as Q670, W680, C236 motherboards, etc.).

Code	Phase	Description
0	Initialization	CPU reset completed, BIOS execution begins
01 ~ 0F	CPU/Memory Initialization	CPU detection, memory training, memory initialization
10 ~ 1F	Memory Test	ECC check, memory mapping
20 ~ 2F	System Initialization	Initialize chipset, PCH, power management
30 ~ 3F	Device Enumeration	Enumerate PCI/PCIe devices
40 ~ 4F	Option ROM	Load device BIOS (e.g., VGA OPR0M, network OPR0M)
50	Display Initialization	Initialize display devices (VGA / UEFI GOP)
55	Critical Error	Display device not detected / GPU initialization failed
		Common causes: no GPU, GPU failure, PCIe slot issue, OPR0M load failure, often memory issue
60 ~ 6F	Input Devices	Initialize keyboard, mouse (PS/2 or USB)
70 ~ 7F	Storage Devices	Initialize SATA, NVMe, M.2 controllers
80 ~ 8F	Network Devices	Initialize network controllers (PXE, iPXE)
90	Firmware Update	BIOS update in progress (Flash programming)
95	Platform Initialization Complete	DXE phase finished, preparing for BDS (Boot Device Selection)
		Hardware initialization basically complete, ready to select boot device

A0 ~ A9	Boot Device Selection	Check bootable devices (HDD, USB, network, etc.)
AA	System Boot	Bootable device found, OS loading begins
		Usually accompanied by double short beep or LED steady on
AB ~ AF	OS Loading	Jump to OS loader (e.g., GRUB, Windows Boot Manager)
B0	System Resume from Sleep	Resume from S4/S5 state
B1	ACPI Initialization	Load DSDT/SSDT, initialize power management
B2	Memory Training Complete / Memory Configured	Memory successfully initialized, XMP/DOCP applied, running at target frequency
B3	TPM Initialization	Initialize Trusted Platform Module
B4	Secure Boot	Check Secure Boot policy
B5	Preparing OS Loader / Exit Boot Services	BIOS handing control to OS
		If stuck here, boot device may lack valid boot record (MBR/GPT issue)
C0 ~ C9	USB Initialization	Initialize USB controllers and devices
D0 ~ DF	Overclock / OC Settings	Apply overclock settings (XMP, DOCP, manual settings)
E0 ~ EF	Reserved / Vendor Custom	Vendor-defined meanings
F0 ~ FF	System Ready	Boot completed or error code

Appendix B

Detailed Explanation of AMI PEI Boot Process and Diagnostic Codes Complete AMI PEI + DXE POST Code Reference Table

1. Overview of the UEFI Boot Process

Phase	Description
SEC	Security Phase (usually no POST Code)
PEI	Pre-EFI Initialization
	Early hardware initialization: CPU, memory, chipset
DXE	Driver Execution Environment
	Driver execution: PCIe, USB, SATA, ACPI, Setup
BDS	Boot Device Selection
	Select boot device and load operating system
TSL	Transient System Load
	OS boot loading
RT	Runtime
	OS takes over, UEFI runtime services

This table focuses on the PEI → DXE phases, which are the core stages for hardware initialization and fault diagnosis.

2. Detailed AMI PEI Phase POST Codes

✓ Normal Boot Progress Codes

Code (Hex)	Macro Definition	Description	Module	Notes
0x10	PEI_CORE_START	PEI core started	Initialization	PEI phase begins, CPU enters CAR mode
0x11	PEI_CAR_CPU_INIT	CPU initialization in CAR mode	CPU	Cache as RAM enabled
0x15	PEI_CAR_NB_INIT	Northbridge initialization in CAR mode	Chipset	Memory controller initialized

0x19	PEI_CAR_SB_INIT	Southbridge initialization in CAR mode	Chipset	PCH initialized
0x2B	PEI_MEMORY_SPD_READ	Start reading memory SPD information	Memory	Read SPD EEPROM on memory modules
0x2C	PEI_MEMORY_PRESENCE_DETECT	Memory presence detection	Memory	Detect whether memory modules are installed
0x2D	PEI_MEMORY_TIMING	Set memory timing parameters	Memory	Configure tCL/tRCD/tRP, etc.
0x2E	PEI_MEMORY_CONFIGURING	Memory controller configuration	Memory	Prepare for memory training
0x2F	PEI_MEMORY_INIT	Memory training start	Memory	Memory Training process begins
0x31	PEI_MEMORY_INSTALLED	Memory installed	Memory	Memory is available, stack accessible
0x32	PEI_CPU_INIT	CPU formal initialization	CPU	Multi-core, cache, microcode loading
0x33	PEI_CPU_CACHE_INIT	CPU cache initialization	CPU	Enable L1/L2 caches
0x34	PEI_CPU_AP_INIT	Application Processor (AP) initialization	CPU	Initialize non-bootstrap cores in multi-core system
0x35	PEI_CPU_BSP_SELECT	Bootstrap Processor (BSP) selection	CPU	Determine main/core processor
0x36	PEI_CPU_SMM_INIT	SMM mode initialization	CPU	Prepare System Management Mode environment
0x37	PEI_MEMORY_NB_INIT	Northbridge re-initialization after memory ready	Chipset	Reconfigure memory controller

0x3B	PEI_MEM_SB_INIT	Southbridge re-initialization after memory ready	Chipset	PCH re-initialization
0x4F	PEI_DXE_IPL_STARTED	Start loading DXE phase	Phase Transition	PEI finished, preparing for DXE
0x60	DXE_CORE_STARTED	DXE core started	DXE	DXE driver environment initialized

⚠ **0x1D~0x2A, 0x3F~0x4E, 0x5C~0x5F, 0x7A~0x7F, 0x80~0x8F, 0x9E~0x9F, 0xB8~0xBF, 0xC0~0xCF:** Reserved ranges, used internally by the vendor or AMI.

✗ 2. PEI Phase Error Codes

Code (Hex)	Error Macro Definition	Description	Possible Cause	Recommended Action
0x50	PEI_MEMORY_INVALID_TYPE/SPEED	Memory type/speed not supported	Mixing DDR3/DDR4, XMP overclock failed	Disable XMP, use standard memory
0x51	PEI_MEMORY_SPD_FAIL	SPD read failed	Memory SPD chip damaged, gold finger oxidized	Clean gold fingers, try another slot
0x52	PEI_MEMORY_INVALID_SIZE/MISMATCH	Memory size/config mismatch	Mixing different capacities/frequencies	Use uniform specs, test one stick at a time
0x53	PEI_MEMORY_NOT_DETECTED/NOT_USABLE	Memory not detected	No memory installed, not seated, power issue	Check installation, try DDR4-2133
0x54	PEI_MEMORY_ERROR	General memory error	Training failed, timing issue	Clear CMOS, replace memory
0x55	PEI_MEMORY_NOT_INSTALLED	No memory installed	No memory sticks installed	Insert memory
0x56	PEI_CPU_INVALID_TYPE/SPEED	CPU type/speed not supported	CPU incompatible, BIOS not supported	Check CPU support list, update BIOS
0x57	PEI_CPU_MISMATCH	Multi-CPU mismatch	Different CPU models on server platform	Use identical CPU models

0x58	PEI_CPU_SELF_TEST_FAILED /CACHE_ERROR	CPU self-test/cache failure	CPU damaged, L1/L2 cache fault	Replace CPU
0x59	PEI_CPU_MICROCODE_UPDATE_FAILED /NO_MICROCODE	Microcode update failed	Missing BIOS microcode	Update to latest BIOS
0x5A	PEI_CPU_INTERNAL_ERROR /CPU_ERROR	CPU internal error	Severe hardware fault	Replace CPU
0x5B	PEI_RESET_NOT_AVAILABLE	Cannot reset system	RSMRST# signal abnormal	Check power, clear CMOS
0xF8	PEI_RECOVERY_PPI_NOT_FOUND	Recovery PPI not found	Recovery module not loaded	Recreate recovery disk
0xF9	PEI_RECOVERY_NO_CAPSULE	No BIOS image	USB missing capsule file	Check FAT32 format, file name
0xFA	PEI_RECOVERY_INVALID_CAPSULE	Invalid BIOS capsule	File corrupted, signature error	Re-download BIOS
0xE8	PEI_MEMORY_S3_RESUME_FAILED	S3 memory resume failed	Memory lost power, training failed	Check power and memory
0xE9	PEI_S3_RESUME_PPI_NOT_FOUND	S3 PPI not found	Resume interface missing	Update BIOS
0xEA	PEI_S3_BOOT_SCRIPT_ERROR	S3 script error	NVRAM script corrupted	Clear CMOS
0xEB	PEI_S3_OS_WAKE_ERROR	OS wake-up failed	ACPI issue	Update system and BIOS

3. Detailed AMI DXE Phase POST Codes

✓ Normal DXE Progress Codes

Code (Hex)	Macro Definition	Description	Module	Notes
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0x60	DXE_CORE_STARTED	DXE core started	Initialization	DXE driver environment begins
0x61	DXE_NVRAM_INIT	NVRAM initialization	System	Store Setup configuration
0x62	DXE_SBRUN_INIT	SbRun initialization	Southbridge	Southbridge runtime environment
0x63	DXE_CPU_INIT	CPU driver initialization	CPU	Multi-core, power management
0x68	DXE_NB_HB_INIT	Northbridge host bridge initialization	Chipset	Memory controller bridging
0x69	DXE_NB_INIT	Northbridge function initialization	Chipset	Memory controller functions
0x6A	DXE_NB_SMM_INIT	Northbridge SMM initialization	Chipset	Prepare SMM environment
0x70	DXE_SB_INIT	Southbridge/PCH initialization	Chipset	Main PCH functions initialized
0x71	DXE_SB_SMM_INIT	Southbridge SMM initialization	Chipset	PCH SMM mode
0x72	DXE_SB_DEVICES_INIT	Southbridge device initialization	Chipset	SATA, USB controllers, etc.
0x78	DXE_ACPI_INIT	ACPI initialization	Power Management	Load DSDT/SSDT
0x79	DXE_CSM_INIT	CSM initialization	Compatibility	Support Legacy boot
0x90	DXE_BDS_STARTED	BDS phase started	Boot Selection	Preparing to select boot device
0x91	DXE_BDS_CONNECT_DRIVERS	Connect all drivers	Driver Management	Prepare for device enumeration

0x92	DXE_PCI_B US_BEGIN	PCI bus initialization begins	PCIe	Scan PCIe devices
0x93	DXE_PCI_B US_HPC_IN IT	PCIe hot-plug initialization	PCIe	HPC controller
0x94	DXE_PCI_B US_ENUM	PCI device enumeration	PCIe	Identify all devices
0x95	DXE_PCI_B US_REQUE ST_RESOU RCES	Request resources	PCIe	IRQ, IO, Memory
0x96	DXE_PCI_B US_ASSIG N_RESOUR CES	Assign resources	PCIe	Avoid conflicts
0x97	DXE_CON_ OUT_CONN ECT	Connect console output	Display	GPU, GOP initialization
0x98	DXE_CON_I N_CONNEC T	Connect console input	Input	Keyboard, mouse
0x99	DXE_SIO_I NIT	Super I/O initialization	Legacy Devices	Serial, parallel ports, fans
0x9A	DXE_USB_ BEGIN	USB initialization begins	USB	USB controllers
0x9B	DXE_USB_ RESET	USB bus reset	USB	Reset USB link
0x9C	DXE_USB_ DETECT	USB device detection	USB	Detect USB drives, keyboard, etc.
0x9D	DXE_USB_ ENABLE	Enable USB devices	USB	Enable device functionality

0xA0	DXE_IDE_BEGIN	SATA initialization begins	Storage	SATA controllers
0xA1	DXE_IDE_RESET	SATA controller reset	Storage	Reset SATA link
0xA2	DXE_IDE_DETECT	SATA device detection	Storage	Identify HDD, optical drive
0xA3	DXE_IDE_ENABLE	Enable SATA devices	Storage	Enable HDD
0xA4	DXE_SCSI_BEGIN	SCSI initialization begins	Storage	Server SCSI controllers
0xA5	DXE_SCSI_RESET	SCSI bus reset	Storage	Reset SCSI link
0xA6	DXE_SCSI_DETECT	SCSI device detection	Storage	Identify SCSI devices
0xA7	DXE_SCSI_ENABLE	Enable SCSI devices	Storage	Enable SCSI devices
0xA8	DXE_SETUP_VERIFY_PASSWORD	Verify boot password	Security	Supervisor/User password
0xA9	DXE_SETUP_START	Enter BIOS Setup	System	Display Setup interface
0xAB	DXE_SETUP_INPUT_WAIT	Wait for user input	Input	User operates Setup
0xAD	DXE_READY_TO_BOOT	Ready to boot	Pre-Boot	All devices ready
0xAE	DXE_LEGACY_BOOT	Legacy boot mode	Boot	Using MBR boot

0xAF	DXE_EXIT_BOOT_SERVICES	Exit Boot Services	Critical Node	Hand over control to OS
0xB0	RT_SET_VIRTUAL_ADDRESS_MAPPING_BEGIN	Begin setting virtual address	OS Takeover	Prepare virtual memory for OS
0xB1	RT_SET_VIRTUAL_ADDRESS_MAPPING_END	Virtual address set complete	OS Takeover	Address mapping completed
0xB2	DXE_LEGACY_OPTION_ROM_INIT	Option ROM initialization	Compatibility	GPU, network card BIOS loaded
0xB3	DXE_RESET_SYSTEM	System reset	System	Reboot or warm reset
0xB4	DXE_USB_HOTPLUG	USB hot-plug event	USB	Detect USB insertion/removal
0xB5	DXE_PCI_BUS_HOTPLUG	PCIe hot-plug event	PCIe	Detect PCIe insertion/removal
0xB6	DXE_NVRAM_CLEANUP	NVRAM cleanup	System	Clear invalid settings
0xB7	DXE_CONFIGURATION_RESET	Load Setup Defaults	System	Restore default settings

✗ DXE Phase Error Codes

Code (Hex)	Error Macro Definition	Description	Possible Cause	Recommended Action
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0xD0	DXE_CPU_ERROR	CPU error	Multi-core initialization failed	Check CPU, update BIOS
0xD1	DXE_NB_ERROR	Northbridge error	Memory controller failure	Check memory, motherboard power
0xD2	DXE_SB_ERROR	Southbridge error	PCH initialization failed	Clear CMOS, check power
0xD3	DXE_ARCH_PROTOCOL_NOT_AVAILABLE	Architecture protocol not available	Critical UEFI protocol missing	Update BIOS
0xD4	DXE_PCI_BUS_OUT_OF_RESOURCES	PCI resources exhausted	IRQ/IO/Memory insufficient	Reduce devices, update BIOS
0xD5	DXE_LEGACY_OPRM_NO_SPACE	OPROM space insufficient	GPU BIOS too large	Disable CSM or change GPU
0xD6	DXE_NO_CON_OUT	No console output	No GPU or GOP failure	Check GPU and monitor
0xD7	DXE_NO_CON_IN	No console input	No keyboard detected	Check PS/2 or USB keyboard
0xD8	DXE_INVALID_PASSWORD	Invalid password	BIOS password entered incorrectly	Clear CMOS or use jumper
0xD9	DXE_BOOT_OPTION_LOAD_ERROR	Boot option load failed	MBR/GPT corrupted	Repair boot, replace drive
0xDA	DXE_BOOT_OPTION_FAILED	Boot failed	OS could not be loaded	Check boot mode
0xDB	DXE_FLASH_UPDATE_FAILED	BIOS flash update failed	Flash operation failed	Re-flash BIOS, check voltage

0xDC	DXE_RESET_NOT_AVAILABLE	Reset not available	RSMRST# signal abnormal	Check power and motherboard
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✿ 4. Key Checkpoints and Troubleshooting Recommendations

Code	Description	Troubleshooting Recommendation
0x31	Memory initialization complete	If stuck here, focus on memory checks
0x4F	Entering DXE	If stuck, DXE driver loading may have failed
0x97	GPU connected	If no display, check GPU, CSM, GOP
0x9C	USB detection	If stuck, remove USB devices
0xA2	Hard drive detection	If not detected, check SATA cable and drives
0xAD	Ready to boot	If not booting, check boot option settings
0xAF	Hand over control	If stuck, OS boot may be corrupted

We analyze this from two dimensions:

- **ProgressCheckpointMap:** Key progress nodes during normal system boot (0x10 ~ 0xF4)
- **ErrorCheckpointMap:** Hardware error codes triggered during boot failure (0x50 ~ 0xFB)