

Lenovo Diagnostics UEFI Embedded/Bootable v04.34.001

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2023

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1 Introduction

Lenovo Diagnostics UEFI is a hardware diagnosis tool that enables the users to verify, on their machines, if hardware pieces are presenting problems or malfunctioning, by performing a wide variety of tests, from a list of 17 supported hardware components.

This document describes what is necessary to run the Lenovo Diagnostics UEFI Embedded/Bootable tests.

2 Install and run UEFI diagnostics

Note

This application is capable of exporting test results to text and JSON files, if users wish to. Please, be aware that machine information, such as model and serial number, are always present on this files, to facilitate the tested machine's identification.

No installation is required for the Lenovo Diagnostics UEFI Embedded.

Lenovo Diagnostics UEFI Bootable version can be executed by booting the machine directly from a bootable device (i.e. a pendrive). To understand how to prepare a pendrive to run the application, please follow the steps bellow.

2.1 Download the Lenovo Diagnostics UEFI Bootable and Create a Bootable USB Flash Drive Using Windows GUI

Save the UEFI Diagnostics image and Bootable Generator:

- Go to www.Lenovo.com/diags.
- Click on "Downloads".
- Under "Lenovo Diagnostics UEFI Bootable", click on "Create Bootable USB with UEFI Diagnostics".
- Download UEFI Diagnostics zip file. Save the file. (If your system has an Atom CPU, then click on "Lenovo UEFI Diagnostics – Bootable USB for Atom CPU based Tablet – ThinkPad 10" instead).
- Download Bootable Generator Zip file.
- Run the Bootable Generator application:
 - Insert a USB flash drive.
 - Go to the folder where you saved the bootable generator and double-click on it.
 - Double-click on "BootableGenerator.exe".
 - Your flash drive name will appear under "Select a device". Click to select it. If you want to, you can type a new name for the device.
 - Click on "Search". Click on the image name that you saved in step 1, letter d.

- Click on "Generate".
- A message will appear, warning that all existing files on the flash drive will be erased if you continue. If you are OK with that, then press "Yes" to continue.

2.2 Run the UEFI diagnostics

2.2.1 Run the Lenovo Diagnostics UEFI Bootable from a Bootable Flash Drive

- 1. Create the Bootable flash drive, as explained in sections 1 and 2.
- 2. If Secure Boot is enabled in BIOS, disable it.
- 3. Insert the flash drive.
- 4. Restart the machine, then immediately press F12.
- 5. On the boot menu, select your USB flash drive, and press Enter.
- 6. The UEFI diagnostics menu will display on your screen.

Bootable Home

The Home screen for Lenovo Diagnostics UEFI is shown in the next figure.

\$ LENOVO	Diagnostics	5 UEFI		54%	Time 09:19 - Version	XX.XX.XXX		
HOME								
DIAGNOSTICS				TOOLS				
STORAGE	[5]		MEMORY [E]		SYSTEM INFORMATION	[F1]		
BATTERY	ເງງ		CPU (U)		BAD BLOCK RECOVERY	[F3]		
DISPLAY	(D)		Fan (F)		DATA DISPOSAL (F4)			
KEYBOARD [K] MOTHERBOARD [H]			SMART INFORMATION	[F5]				
MOUSE [W] PCI EXPRESS [P]			FAN SPEED [F7]					
SENSOR [נא		WIRED ETHERNET (L)					
			More [[M]				
			RUN ALL [R]					
Some of the modules have BIOS internal protocols dependency and may not be displayed								
Navigation	n [Arrows]	En	ter [Space]	About [A]	Ех	it [Esc]		

Figure 1: Home screen 1 - bootable version

On the Lenovo home screen, when the number of modules exceeds the window size, the application enables the 'More' button to follow to the second page.

~	LENOVO	Diagnostic	s UEFI			53% <mark>-</mark>	Time 08:24	- Version	xx.xx.xxx
				HOP	1E				
			DIAGNOSTICS	1				TOOLS	
	WIRED	ETHERNET [L]					SYSTEM IN	FORMATION	[F1]
							BAD BLOCH	K RECOVERY	[F3]
							DATA D	ISPOSAL (F4	4]
							SMART IN	FORMATION	(F5)
							Fan	SPEED (F7)	
					Back [B]				
				run all	[R]				
	Sor	ne of the modul	les have BIOS	internal pro	tocols depend	ency	and may not	be displaye	ed
	Navigati	ion [Arrows]	Enter	Space]	About	. [A]		Exi	it [Esc]

The second Home screen for Lenovo Diagnostics UEFI is shown in the next figure.

Figure 2: Home screen 2 - bootable version

On the Lenovo home screen when the user is on the second page, the application enables the 'Back' button to return to the first page.

The Home screen is displayed right after the machine is booted from a USB flash drive containing the application. The Home screen provides options to run all available tests for devices installed in the machine, options to see detailed information about these devices, and an option to exit the application. The Home screen is composed of:

- Application Header Bar;
- Screen Title Bar;
- Two main sections (Diagnostics and Tools);
 - The currently selected option in these sections is outlined in red.
- Instruction Footer Bar;

The Application Header Bar contains the name of the application, battery AC adapter indicator, battery capacity indicator, system time and current version of the application.

The Screen Title Bar helps the user to be attentive to where s/he is throughout the application. The Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The color of the battery capacity indicator follows the conditions below:

- Battery Charge >= 50% >GREEN
- 50% > Battery Charge >= 20% >YELLOW
- Battery Charge < 20% >RED

The Home screen has two main sections: Diagnostics and Tools. The Diagnostics section provides options to run all installed tests, and the Tools section provides options for using extra tools.

The currently selected option is outlined in red. The user can change the selected option either by using mouse/touch (for systems that support mouse/touch navigation) or by using the arrow keys (<>>>) and enter the selected option by pressing SPACE or ENTER.

Diagnostics options, sub-options and their descriptions are subsequently described:

- Run All: It allows the user to run all tests in one single execution. The Run all option has 4 modes:
 - Quick (Unattended): It executes the quick diagnostics of the modules that are unattended (does not require human intervention).
 - Quick: It executes all the quick diagnostics of the modules.
 - Full (Unattended): It executes both quick and extended diagnostics of the modules that are unattended.
 - Full: It executes all the diagnostics of the modules.
- Battery:
 - Quick: It selects and runs the battery quick diagnostics.
 - Extended: It selects and runs the battery extended diagnostics.
- CPU:
 - Quick: It selects and runs the CPU quick diagnostics.
 - Extended: It selects and runs the CPU extended diagnostics.
- Display:
 - Quick: It selects and runs the display diagnostics.
- Fan:
 - Quick: It selects and runs the fan diagnostics.
- Keyboard (Module available only for ThinkPad machines):
 - Quick: It selects and runs the keyboard diagnostics.

- Memory:
 - Quick: It selects and runs the memory quick diagnostics.
 - Extended: It selects and runs the memory extended diagnostics.
- Motherboard:
 - Quick: It selects and runs the motherboard diagnostics.
- Mouse (Module available only for ThinkPad machines):
 - Quick: It selects and runs the the mouse diagnostics.
- Optical:
 - Quick: It selects and runs the optical diagnostics.
- RAID:
 - Quick: It selects and runs the physical RAID diagnostics.
 - Extended: It selects and runs the pirtual RAID diagnostics.
- Sensor (Module available only for ThinkPad Machines)
 - Quick: It selects and runs the sensor diagnostics.
- Storage:
 - Quick: It selects and runs the storage quick diagnostics.
 - Extended: It selects and runs the storage extended diagnostics.
- Touch:
 - Quick: It selects and runs the touch diagnostics.
- Wired Ethernet:
 - Quick: It selects and runs the wired ethernet diagnostics.
- Audio:
 - Quick: It selects and runs the audio diagnostics.



- Battery AC indicator and battery capacity indicator may not be displayed for systems that does not support smart battery feature (not responds to LENOVO_BATTERY_INFO_PROTOCOL);
- For battery, CPU, keyboard, mouse, sensor, optical and wired ethernet diagnostic modules, if there is more than one device opens the device selection screen.
- For modules that have more than one device installed (except for memory) the application will open the device selection screen.

Tools options are:

- System Information: On its main screen, it displays machine, BIOS and processor information, as well as a menu from which it is possible to retrieve information from other devices modules.
- Diagnostic Event Log: It exhibits diagnostic events retrieved from the hardware.
- Bad Block Recovery: It allows for the recovery of bad blocks on storage devices.
- Data Disposal: Storage tool that erases all data from the storage device (For the embedded version, it is only available for ARM architectures).
- SMART Information: Tool used to obtain information related to the hardware condition, reported by the S.M.A.R.T (Self-Monitoring, Analysis and Reporting Technology). Monitoring system of HDDs, SSDs and NVMes, in order to prevent imminent hardware failures.
- Fan Tool: Tool used to measure and check the relation between the fan speed and the processor temperature.



- Tests and tools rely on UEFI protocols availability, therefore some features might not be available on some systems;
- Attended tests require human intervention by interacting with a mouse, keyboard, fingerprint or touch devices depending on the selected test. To avoid issues with unresponsive devices an automatic popup will be prompted announcing to the user that after 15 seconds of no interaction the test will stop;
- Text font may vary from system to system;
- For Bad Block Recovery, Data Disposal and SMART Information, if there is more than one Storage device, the application will open the device selection screen.

2.2.2 Run the Lenovo Diagnostics UEFI Embedded

Lenovo Diagnostics UEFI Embedded version is always available on machines fabricated by Lenovo. The tool can be accessed directly from the machine's BIOS, as explained by the steps bellow.

- Boot the system and, then, immediately press F10 for Thinkpad, ThinkBook or SMB systems.
- Access the Novo button menu for IdeaPad systems, then select Lenovo UEFI Diagnostics from the menu.

Embedded Home

The Home screen for Lenovo Diagnostics UEFI is shown in the next figure.

\$ LENOVO	Diagnostics	UEFI			<mark>76%</mark>	Time 05:	40 - Version	XX.XX.XXX
				HOME				
		DIAGNOS	STICS				TOOLS	
STORAGE	[5]		MEMORY (E)			SYSTEM	INFORMATION	[F1]
BATTERY	[J]		CPU [U]			BAD BL	OCK RECOVERY	[F3]
DISPLAY	[D]		Fan [F]			DATA	A DISPOSAL (I	54]
KEYBOARD	(K)		MOTHERBOARD	(H)		SMART	INFORMATION	(F5)
MOUSE EW	נו		PCI EXPRESS	[P]		Ff	an speed (F7)	
SENSOR [кі		FINGERPRINT	(N)				
				More	(M)			
			RUN F	ALL (R)				
Some	of the module	es have I	BIOS internal j	protocols	dependency	and may no	ot be displa <u>u</u>	jed
Navigation	n [Arrows]	Ent	er [Space]		About [A]		Ех	it [Esc]

Figure 3: Home screen 1 - embedded version

On the Lenovo home screen when the number of modules exceeds the window size, the application enables the 'More' button to follow to the second page.

The second Home screen for Lenovo Diagnostics UEFI is shown in the next figure.

4	LENOVO	Diagnostic	5 UEFI		767.	Time 05:40	- Version	XX.XX.XXX
				HOME				
			DIAGNOSTICS				TOOLS	
	WIFI [G]					SYSTEM II	NFORMATION	[F1]
						BAD BLOCI	K RECOVERY	[F3]
						DATA D	ISPOSAL (F4	1]
						SMART IN	FORMATION	(F5)
						Fan	SPEED (F7)	
				Dack (D)				
			R	UN ALL [R]	1			
	Some	of the modul	es have BIOS intern	al protocols deper	ndency	and may not	be displaye	ed
	Navigation	[Arrows]	Enter [Space]	Abou	ıt [A]		Exi	it [Esc]

Figure 4: Home screen 2 - embedded version

On the Lenovo home screen when the user is on the second page, the application enables the 'Back' button to return to the first page.

The Home screen is displayed right after the machine is booted from a USB flash drive containing the application. The Home screen provides options to run all available tests for devices installed in the machine, options to see detailed information about these devices, and an option to exit the application. The Home screen is composed of:

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The color of the battery capacity indicator follows the conditions below:

Battery Charge >= 50% >GREEN

- 50% > Battery Charge >= 20% >YELLOW
- Battery Charge < 20% >RED

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The currently selected option is outlined in red. The user can change the selected option either by using mouse/touch (for systems that support mouse/touch navigation) or by using the arrow keys (<>>>) and enter the selected option by pressing SPACE or ENTER.

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 - Full (Unattended): It executes both quick and extended diagnostics of the modules that are unattended.
 - Full: It executes all the diagnostics of the modules.
- Battery:
 - Quick: It selects and runs the battery quick diagnostics.
 - Extended: It selects and runs the battery extended diagnostics.
- CPU:
 - Quick: It selects and runs the CPU quick diagnostics.
 - Extended: It selects and runs the CPU extended diagnostics.
- Display:
 - Quick: It selects and runs the display diagnostics.
- Fan:
 - Quick: It selects and runs the fan diagnostics.
- Keyboard (Module available only for ThinkPad machines):
 - Quick: It selects and runs the keyboard diagnostics.
- Memory:
 - Quick: It selects and runs the memory quick diagnostics.
 - Extended: It selects and runs the memory extended diagnostics.
- Motherboard:
 - Quick: It selects and runs the motherboard diagnostics.

- Mouse (Module available only for ThinkPad machines):
 - Quick: It selects and runs the the mouse diagnostics.
- Optical:
 - Quick: It selects and runs the optical diagnostics.
- RAID:
 - Quick: It selects and runs the physical RAID diagnostics.
 - Extended: It selects and runs the pirtual RAID diagnostics.
- Sensor (Module available only for ThinkPad Machines)
 - Quick: It selects and runs the sensor diagnostics.
- Storage:
 - Quick: It selects and runs the storage quick diagnostics.
 - Extended: It selects and runs the storage extended diagnostics.
- Touch:
 - Quick: It selects and runs the touch diagnostics.
- Wired Ethernet:
 - Quick: It selects and runs the wired ethernet diagnostics.
- Audio:
 - Quick: It selects and runs the audio diagnostics.



- Battery AC indicator and battery capacity indicator may not be displayed for systems that does not support smart battery feature (not responds to LENOVO_BATTERY_INFO_PROTOCOL);
- For battery, CPU, keyboard, mouse, sensor, optical and wired ethernet diagnostic modules, if there is more than one device opens the device selection screen.
- For modules that have more than one device installed (except for memory) the application will open the device selection screen.

Tools options are:

- System Information: On its main screen, it displays machine, BIOS and processor information, as well as a menu from which it is possible to retrieve information from other devices modules.
- Diagnostic Event Log: It exhibits diagnostic events retrieved from the hardware.

- Bad Block Recovery: It allows for the recovery of bad blocks on storage devices.
- Data Disposal: Storage tool that erases all data from the storage device (For the embedded version, it is only available for ARM architectures).
- SMART Information: Tool used to obtain information related to the hardware condition, reported by the S.M.A.R.T (Self-Monitoring, Analysis and Reporting Technology). Monitoring system of HDDs, SSDs and NVMes, in order to prevent imminent hardware failures.
- Fan Tool: Tool used to measure and check the relation between the fan speed and the processor temperature.



- Tests and tools rely on UEFI protocols availability, therefore some features might not be available on some systems;
- Attended tests require human intervention by interacting with a mouse, keyboard, fingerprint or touch devices depending on the selected test. To avoid issues with unresponsive devices an automatic popup will be prompted announcing to the user that after 15 seconds of no interaction the test will stop;
- Text font may vary from system to system;
- For Bad Block Recovery, Data Disposal and SMART Information, if there is more than one Storage device, the application will open the device selection screen.

3 Automated Execution

Automated Execution is a feature that allows the user to set an amount of diagnostics from a JSON configuration file to be executed from different modules and devices at the UEFI application with no user interaction during execution. It allows the user to configure which specific diagnostics should be run on each device.

The user also has the option to configure the amount of times the machine should reboot. If the machine is rebooted, all the diagnostics will run again until the machine has rebooted the configured number of times.

3.1 Startup Script

In order to make it fully automated a startup.nsh script should be created and placed in the flash drive where are the application and the configuration file. This will be used to call the application by itself with no need for the user to do it. The content of this script can be seen below:

3.2 JSON configuration file

An example of the JSON configuration file with modules, devices, and diagnostics configured can be seen below:

```
{
        "no_boots": 1,
        "times_to_run": 3,
        "duration": 1,
        "automated_exec": [
        {
                 "module": "CP_Q",
                 "execution": [
                 {
                         "deviceId": 0,
                         "tests": [8, 9]
                 }
                 ]
        },
        {
                 "module": "HD_Q",
                 "execution": [
                 {
                         "deviceId": 0,
                         "tests": [2, 18, 19, 20]
                }
                ]
        }
        ]
}
```

Config Key	Config Value (eg)	What it means			
no_boots	1	The no_boots parameter sets the amount of times the feature will reboot the machine and execute all the test flow configured. If set to 1 then the machine will boot, run the test cycle, reboot, run it again and finishes.			
times_to_run	2	The times_to_run parameter is used to set the amount of times each test will run. So in this case each test will be executed 2 times per boot interaction.			
duration	5	Duration defines how long the tests must run in minutes. This parameter has priority over the times_to_run parameter. If a test takes longer than the duration and the time limit is reached the test will be cancelled, if a test lasts less than a duration it will be ex- ecuted more than once until the time limit is reached.			
automated_exec	vector[]	The automated_exec vector is where the feature flow will be set, is where the user can set the modules, devices and tests that will be executed.			
module	CP_Q, ME_E	The module is to define which suite will be executed, it follows the Shell View stan- dards using ModuleShortName. CP_Q is for CPU quick and ME_E is for memory ex- tended.			

Table 1: List of parameters and their explanation

Table 2: List of parameters and their explanation

Config Key	Config Value (eg)	What it means
execution	vector[]	The execution vector defines what is going
		to be executed by each suite, is where the
		user can define the device and tests per de-
		vice that will run.
deviceId	0, 1	The deviceId parameter sets which device is
		being executed per execution index inside
		the suite, it follows the id of the Shell View
		app standards using DeviceIndex.
tests	0, 1, 2, 3, 12	The tests parameter defines which tests will
		be executed per deviceld inside execution
		vector, it follows the Shell View app stan-
		dards using TestIndex.

3.3 JSON keys and values

• The JSON configuration file must be called AutoExecConfig.json to be found by the application;

- When setting duration, no_boots, deviceId, and testId the parser will validate negative numbers and consider them as invalid parameters;
- Any parameter configured using decimal numbers will be rounded by the application;
- Times to run can not be set to zero, this will result on an invalid parameter.

4 Hierarchical Diagnosis

The hierarchical diagnostics functionality is a feature that conducts to hierarchic sorted tests, in the way that the more independent is a module, the more its tests take precedent in the tests hierarchy.

That allows the identification of modules failures that precede a specific module being diagnosed, where its corresponding tests have firstly failed.

After testing a specific module, in the case of at least one failure has occurred, the following popup will be displayed.

LENOVO	Diagnostics UEFI	- = 100× Time 00:00 - Version XX.XX.XXX		
	DISPLAY			
	DIAGNOSTICS EXECUTION			
	Final Result Code: A123B4C5C-DEFGHI			
	HIERARCHICAL DIAGNOSTICS One or more tests have failed, do you want to diagnose correlated dependencies/modules?			
	No [ESC]	Yes		

Figure 5: Hierarchical diagnosis confirmation pop-up

When choosing Yes, the application will test the correlated modules, as the following figure demonstrates it by using a Display test failure example.

LENOVO	Diagnost	ics UEFI		-== 100%	Time 06:23	- Versio	n XX.X	X.XXX
		DIS	SPLAY - HIERARCH	ICAL DIAGNOSTICS				
			DIAGNOSTICS	EXECUTION				
	Sta Reg BT X87 MMX SSE AES FMA AUX Cac CLM TSX Fin RES	rted at: ister Test: Instruction T Floating Poi Test: Test: Test: Test: 2 Test: 2 Test: be Test: UL Test: ished at: ULT CODE:	'est: int Test:	2023/11/24 06:2 PASSED PASSED PASSED PASSED PASSED PASSED PASSED Waiting Waiting Waiting 0000/00/00 00:0	23 : 30 00 : 00 -			Ť
м	OTHERBOARD							1
Total esti	mated time:	: 00:00:23 of	07:32:39		Stop	Tests	(Esc)	
Navigation	[Arrows]			PgUp [F9]	PgDn [F1	0]	Home	[Esc]

Figure 6: Hierarchical diagnosis execution

5 Times to run

Times To Run is a feature that is available for all Diagnostic Modules and Run All.

By selecting a test option, the user can choose how many times this test will run.

The application will then run the selected test as many times as the user has set in the Times to Run field.

Times to Run ≪ < 2 >>>			
		Confirm [C]	
Navigation [Arrows]	Enter [Space]	Times to Run Info [T]	Home [Esc]

Figure 7: Times to run field settings

When the system finishes the selected test, the Diagnostics Execution will be displayed with breaks for each round: Execution Number 1, Execution Number 2,... up to the limit of the number set in the Times To Run field.

LENOVO	Diagnost	ics UEFI	-== 100%•	Time 06:24 -\	Version XX.XX.XXX
		BATTERY	- EXTENDED		
		DIAGNOSTIC	S EXECUTION		
					t
F	inal Result	t Code:			
В	ATTERY: SME	2			
	Exe Sta Bat Fin RES	ecution Number: 1 arted at: tery Charge Test: tery Discharge Test: hished at: GULT CODE:	2023/11/24 06:2 NOT APPLICABLE Progress [0/] 0000/00/00 00:0	4:41 0:00	
	Exe Sta Bat Fin RFS	ecution Number: 2 urted at: utery Charge Test: utery Discharge Test: uished at:	0000/00/00 00:0 Waiting Waiting 0000/00/00 00:0	0:00 0:00	ł
				Stop Te	ests [Esc]
Total esti	mated time	: 00:00:09 of 03:40:00			
Navigation	[Arrows]		PgUp [F9]	PgDn [F10]	Home [Esc]

Figure 8: Times to run Diagnostics execution example



- There are maximum and minimal limits for Times to Run selection
 - In each diagnostic module the range is 1 50
 - In Run All execution the range is 1 5
- If Times to Run was set to run only once, "Execution Number 1" will not be displayed.

6 Audio

The system allows the user to access the audio diagnostics from the Home screen, Diagnostics, Audio.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

\$	LENOVO	Diagnos	stics UEFI		- - = 99%	Time	12:27 -	Version XX.	xx.xxx	
				AUDIO: Audio	Device					
				ALGORITHM SE	LECTION					
		E	X] Select / Des	elect All Optic	ms]			
	[X] Internal Speaker Test									
	Times to	Run								
		///								
				Confirm	[C]					
N	avigation	[Arrows]	Enter [Space]	Times to Run I	Info [T]			Home	[Esc]	

Figure 9: Audio algorithm selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen The Audio Execution screen provides information about the Audio diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

5	LENOVO	Diagnosti	ics UEFI		-82	100×	Time 00:00 -	- Version	xx.xx.xxx
		<u>j</u>		AUD	10	_			
_				102	10				
				DIAGNOSTICS	EXECUTION				
		Final Result	Code :	U1TUMS2US-2261V9		加強が必要が			T
		Audio Device							- 1
		Star Inte Fin	rted at: ernal Sp ished at	eaker Test:	2022/12/01 02: PASSED 2022/12/01 02·	55:26 55:33			1
							View	Log [V]	
	lotal es	timated time:	00:00:0	7 of 00:00:15					
I	4av igat io	on [Arrows]			PgUp [F9]		PgDn [F10]	Hom	e [Esc]

Figure 10: Audio diagnostics execution

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- QR Code (QR code shown on the right side of Final Result Code and that contain the information below, concatenated with semicolon):
 - Final Result Code;
 - Serial Number;
 - Test Date (YYYYMMDD format);
 - Machine Model;
 - BIOS Version;
 - UEFI Diags version;
 - Machine Type-Model (MTM);
 - Wired MAC Address (if not available, hide this information);
 - Wireless MAC Address (if not available, hide this information);
- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - CANCELED, indicating the algorithm has been canceled by user.
 - **NOT APPLICABLE**, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).



The Audio module is currently only be available for TP L Gen 3 machines.

7 Battery

The battery module is available in only few models due to UEFI protocols availability.

The system allows the user to access the battery diagnostics from the Home screen, Diagnostics, Battery.

After the user enters the Battery option, the Battery Diagnostics Type menu will be displayed as the following image.

*	LENOVO	Diagnos	tics UI	EFI			- - = 100×	Time 00:00 -	Version XX	
					BATTERY					
					DIAGNOSTICS	ТЧРЕ				
		[[X] Qu] Ex	ick tended						
					Confirm [с)				
Na	avigation	[Arrows]	Enter	[Space]					Home	[Esc]

Figure 11: Battery diagnostics type

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show quick and extended diagnostic types, as illustrated in the next figure.



If more than one battery is installed, Battery Extended diagnostic type won't be available due to UEFI detection limitation.

The system will skip Diagnostics Type screen and present Quick Algorithm Selection screen.

If there is more than one battery device installed, the Diagnostics Type menu will not be displayed.

After the diagnostic type selection, the menu Device Selection is displayed as shown

in the next figure.

LENOVO	Diagnostics	UEFI			- - - 100×	Time 00:00 - Ue	ersion XX	.xx.xxx
			BATT	ERY				
			DEVICE S	ELECTION				
	[X]	Select / De	select All Op	tions				
	[X] [X]	213-SANYO 63-SMP						
			Confir	m [C]				
Navigation	[Arrows]	Enter	[Space]				Home	[Esc]

Figure 12: Battery device selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

After the user selected a diagnostic type, all available tests will be displayed for execution. The available tests for quick diagnostics are illustrated in the next figure:

\$	LENOVO	Diagnos	stics UEFI			- - = <mark>100×</mark> ∎	Time 00:00 -	Version XX.XX	.xxx
				BATTERY	1: 213-Sanyo				
				ALGORITH	M SELECTION				
		[X] Select / Des	elect All	Options				
		[X] Health Test	Teet					
		L	n'i icmperature	1050					
	Times to	Run > >>							
				Conf	`irm [C]				
N	avigation	[Arrows]	Enter [Space]	Times to	Run Info [T]			Home [E	scl

Figure 13: Battery quick algorithm selection

The available tests for extended diagnostics are illustrated in the next figure:

LENOVO	Diagnostics UEFI	-1:	1002 Time 00:00 - Version XX.XX.XXX
		BATTERY	
		DIAGNOSTICS TYPE	
	[] Quick [X] Extended		
		Confirm [C]	
Navigation	[Arrows] Enter [Space]		Home [Esc]

Figure 14: Battery extended type selection

LENOVO	Diagnostics UEFI	- 1 = 1002 Time 00:00 - Version XX.XX.XXX
	BATTERY 1:213-SANYO	
	ALGORITHM SELECTION	
	[X] Select / Deselect All Options	
	[X] Battery Charge Test [X] Battery Discharge Test	
	t in a bactery procharge rest	
Times to R << < 1 >	un 🔊	
	Confirm [C]	
Navigation [A	nrows] Enter [Space] Times to Run Info [T]	Home [Esc]

Figure 15: Battery extended algorithm selection

After choosing Extended Charge or Discharge Tests, a popup message will be displayed as illustrated below:



Figure 16: Battery charge test pop-up



Figure 17: Battery discharge test pop-up

To avoid the processing of incorrect results on the log, the system will initiate a timer of 15 seconds after the pop-up is closed, in which the battery controller has time to detect the change of status (connected / disconnected). Currently, this timer is not visible to the user, and can be followed by the execution time, on the bottom of the test screen.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button. Consequently, the system will run all tests, as illustrated in the figure below.

÷	LENOVO	Diagnostics UEFI		- i = <mark>43%</mark> •	Time 13:41	l - Versi	on XX.X	x.xxx
			BATTERY	– QUICK				
			DIAGNOSTICS	EXECUTION				
		Final Result Code:	U1Q8WEMFL-SK9L4C					T
		BATTERY : Sunwoda						
		Started at: Health Test Temperature Finished at	: Test:	2023/11/24 13:4 PASSED PASSED 2023/11/24 13:4	12:25	liou I ar	rın —	
	Total es	timated time: 00:00:0	2 of 00:00:40			Ten Log	101	
N	avigatio	m [Arrows]		PgUp [F9]	PgDn [F	10]	Home	[Esc]

Figure 18: Battery quick diagnostic execution

æ	LENOVO	Diagnost	ics UEFI		- 1 = 44% •	Time	13:42	- Versi	on XX.X	XXXX
				BATTERY -	EXTENDED					
				DIAGNOSTICS	EXECUTION					
		Final Result	Code :	U1FHZLT JK-XGBETC						1
		BATTERY : Sun	woda							
		Star Bat Bat	rted at: tery Cha tery Dis ished at	rge Test: charge Test:	2023/11/24 13:4 Canceled Canceled 2023/11/24 13:4	2:45 2.55				ł
							Vi	ew Log	[V]	
	Total es	timated time:	00:00:1	0 of 00:20:00						
N	lav igat ic	m [Arrows]			PgUp [F9]	Pg	rDn (F1	01	Home	[Esc]

Figure 19: Battery extended diagnostic execution

The Battery Diagnostics Execution screen provides information about the battery diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a "View Log" button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - **FAILED**, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).

8 CPU

The system allows the user to access the CPU diagnostics from the Home screen, Diagnostics, CPU.

After the user enters the CPU option, the CPU diagnostics type menu will be displayed as the following image.

LENOVO	Diagnosti	cs UEFI			- - - 100 ו	Time 00:00 - Ve	rsion XX	.xx.xxx
			С	PU				
			DIAGNOS'	FICS TYPE				
	[x] Quick] Extended						4
			Conf i	rm [C]				
Navigation	n [Arrows]	Enter	[Space]				Home	[Esc]

Figure 20: CPU diagnostics type

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it.

After the user enters the "Confirm" button, the application will display the CPU devices available in the system. If there is more than one CPU device installed, the menu Device Selection is displayed, as shown in the next figure.

LENOVO	Diagnostic	s UEFI		- 100ו Time 6	00:00 - Version XX.XX.XXX
			CPU		
			DEVICE SELECTION		
	[×]	Select ∕ Desele	ect All Options		1
	[×] [×]	INTEL AMD			-
			\searrow		
			Confirm [C]		
Navigation	n [Arrows]	Enter [Spac	e]		Home [Esc]

Figure 21: CPU device selection

8.1 CPU quick diagnostics

The system allows the user to access the CPU quick diagnostics from the Home screen, Diagnostics, CPU.

Quick diagnostics are test algorithms that take less than 10 minutes to execute each test.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. To access the CPU quick diagnostics, the user can use the UP/DOWN arrow key until "Quick" is focused and press SPACE key to select it.

In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show a list of tests, as illustrated in the next figure, and all the tests are initially selected to be tested.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects
the "Select/Deselect All Options" again, all tests options will be selected again.

ł	LENOVO	Diagnos	stics UEFI			100×	Time 00:00 - Ve	rsion XX	xx.xxx
			CPU 1: Intel(R)	Core (TM)	i7-6600U	CPU @ 2.60GHz -	INTEL		
				ALGORI	THM SELECT	ION			
		[X] Select / De	select All	l Options				
		[[X] Register Te X] BT Instruct	st ion Test					
		[X] X87 Floating	g Point Te	est				
		[X] MMX Test						
		[X] SSE Test						
		L r	X J HES lest						
		r L	X 1 AUX2 Test						
		[X] Cache Test						
		[X] CLMUL Test						
		ſ	X] ISX Test						
	Times to	Run > >>							
				Co	nfirm [C]				
Na	wigation	[Arrows]	Enter [Space]	Times t	o Run Info	[T]		Home	[Esc]

Figure 22: CPU algorithm selection

LENOVO Dia	mostics UEFI -E= 1007 Time 00:00 - Version XX.XX.XXX
	CPU 1: Snapdragon (TM) 8cx @ 2.84 GHz - QUALCOMM
	ALGORITHM SELECTION
	[X] Select / Deselect All Options
	[X] Math Test
	[X] Floating Point Test
	L X J Extension Instruction Test
	L X J Zero Registers lest
Times to Run ≪ < 1 >>>	
	Confirm [C]
Navigation [Arrow	s] Enter [Space] Times to Run Info [T] Home [Esc]

Figure 23: CPU algorithm selection - ARM version



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button. Consequently, the system will run all tests, as illustrated in the figure below.

k	LENOVO	Diagnostics UEFI		<mark>79%.</mark> •	Time 1	3:51 - Vers	sion XX.	xx.xxx
			CPU -	QUICK				
			DIAGNOSTICS	EXECUTION				
		Final Result Code:	U1P9NEUDK-3C7RS6					T
		CPU: 12th Gen Intel	(R) Core (TM) i7-1270F	p				
	Started at: Register Test: BT Instruction Test: X87 Floating Point Test:			2023/11/10 13:5 PASSED PASSED PASSED PASSED	0:27			ł
						View Log	[V]	
_	Total es	timated time: 00:00:	38 of 00:00:33					
N	avigatio	m [Arrows]		PgUp [F9]	PgD	n [F10]	Home	[Esc]

Figure 24: CPU quick diagnostics execution



Figure 25: CPU quick diagnostics execution - ARM version

The CPU Quick Diagnostics Execution screen provides information about the CPU diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

8.2 CPU extended diagnostics

The system allows the user to access the CPU extended diagnostics from the Home screen, Diagnostics, CPU.

After the user enters the CPU option, the CPU diagnostics type menu will be displayed as the following image.

LENOVO	Diagnostics UEFI		- = 1992 Time 00:00 - Version XX.XX.XXX
		CPU	
		DIAGNOSTICS TY	PE
	[] Quick [X] Extended		
			6
		Confirm [C]	
Navigation	[Arrows] Enter [Space]		Home [Esc]

Figure 26: CPU diagnostics type

Extended Diagnostics may take more than 10 minutes to complete each test.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. To access the CPU extended diagnostics, the user can use the UP/DOWN arrow key until "Extended" is focused and press SPACE key to select it.

In order to continue, the user has to press ENTER in the "Confirm" button .

When the user presses ENTER, the Algorithm Selection screen is displayed, as shown in the figure below.

LENOVO	Diagnostics	UEFI				- - = <u>100×</u> =	Time 00:00 -	Version XX.XX.XX
	CPU	1: Intel(R)	Core (TM)	i7-6600U	CPU @	2.60GHz - 1	INTEL	
			ALGORIT	THM SELECT	ION			
	[X]	Select / Des	elect All	Options				
	[X]	Stress Test						
		•						
Times to R << 1 >	un >>	3						
			Cor	nfirm [C]				
Navigation [A	rrows] Ent	er [Space]	Times to	o Run Info	(T)			Home [Esc]

Figure 27: CPU algorithm selection



If more than one device device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button. Consequently, the system will run all tests, as illustrated in the figure below.

~	LENOVO	Diagnost	ics UEFI		77%.	Time 13:52 -	- Version XX.	xx.xxx
				CPU – EX	(T ENDED			
				DIAGNOSTICS	EXECUTION			
		Final Result	: Code:	U1927M983-7KH5T3				Ť
		CPU: 12th Ge	m Intel(R) Core(TM) i7-12701	2			
	Started at: Stress Test: Finished at: PESUIT CODE:			2023/11/10 13:53:03 CANCELED 2023/11/10 13:53:03				
		4. 4.1.4.	00.00.0	0. 0. 0. 0. 0.		Vie	w Log [V]	
_	Total es	timated time:	: 00:00:0	⊎ of 00:10:00				
N	av igat io	m [Arrows]			PgUp [F9]	PgDn [F10)] Home	[Esc]

Figure 28: CPU extended diagnostics execution

The CPU Extended Diagnostics Execution screen provides information about the CPU diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - **NOT APPLICABLE**, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

9 Display

The system allows the user to access the Display diagnostics from the Home screen, Diagnostics, Display.

After the user enters the Display option, the application computes the number of algorithms that can be performed and the Algorithm Selection screen is displayed, as shown in the figure below.

3	LENOVO Diagn	ostics UEFI	707.	Time	19:53	- Version XX.XX.XXX			
		DISPLAY: CSOT T3 MNG007DA1-C	- CSO						
		ALGORITHM SELECTION							
	[X] Select / Deselect All Options								
		[X] Blue Solid Color Test							
		[X] Green Solid Color Test							
		[X] Black Solid Color Test							
		[X] White Solid Color Test							
		[X] Luminance VESA Test							
		[X] Geometry VESA Test							
		[X] Focus VESA Test							
		[X] Combination Test							
		[X] Access Test							
	Times to Run << < 1 >>>								
		Confirm [C]							
Na	wigation [Arrows]	Enter [Space] Times to Run Info [T]				Home [Esc]			

Figure 29: Display algorithm selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

The Algorithm Selection screen allows the user to select which algorithms will be tested by the application. After the user chooses at least one test and chooses the "Confirm" button on the Algorithm Selection screen, the Display test start.

Before an algorithm is run, a popup containing instructions about the algorithm is displayed, as shown in the following figure. The user can press the ENTER key to proceed with the algorithm execution or can press ESC to abort the test.

LEN0V0	Diagnostics UEFI		100× Time 00:00	- Version XX.XX.XXX					
		DISPLAY							
	DIAGNOSTICS EXECUTION								
Final Result Code:									
DI	SP	GEOMETRY VESA	EST						
	Lines, rectangles a sure that the geome checking your scree	nnd circles will be p etric figures are dis en, click, touch or p	ainted on your screen. M played correctly. After ress any key to continue	ake					
	Cancel [isc J	0k	_					
Intal estin	ated time: 00:00:00 a	1.00-00-05	Sto	p Tests [Esc]					
Navigation [Arrows]	00.00.00		Hone [Esc]					

Figure 30: Display test instruction pop-up

If the user chooses to proceed with the test's execution, an image pattern will be displayed on the screen, as shown in the following figure. After the user checks the screen, user can proceed with the test's execution by pressing any key, mouse click or touch action.



Figure 31: Geometry VESA test

After that, a popup shows up, asking the user if the pattern was correctly painted on the display. If so, the user must press the ENTER key; if not, the user must press the ESC key. This popup can be seen in the next figure.

ł	LENOVO	Diagno	stics UEFI		-8= 100%	Time 06:32 - Veri	sion XXXXXXX nois
				DIS	Play		
				DIAGNOSTICS	EXECUTION		
		Final Resu	It Code:				ľ
	BLUE SOLID COLOR TEST						
			Wa No [Esc	s your screen p :1	ainted correctly? Yes	5	
		F C A F	ocus VESA Test ombination Tes ccess Test: inished at: FSHTT CONF-	: t:	Waiting Waiting Waiting 0000/00/00 00:0	0:00	1
	Iotal es	timated tim	e: 00:00:00 of	00:00:46		Stop Tests	Esc)
N	avigatio	n [Arrows]			PgUp (F9)	PgDn (F10)	Hone [Esc]

Figure 32: Display test result inquiry popup

This process is repeated for each selected algorithm. After the test is finished or canceled, the user can go back to the Home screen by pressing the ESC key again or go to the Diagnostics Result Log screen by pressing the V key.

LENOVO	Diagnost	ics UEFI	-14	100× Time 00:00	- Version XX.XX.XXX
		DI	SPLAY		
		DIAGNOSTIC	S EXECUTION		
	Sta Red Blu Gre Bla Whi Lum	rted at: Solid Color Test: e Solid Color Test: en Solid Color Test: ck Solid Color Test: te Solid Color Test: inance VESA Test:	2022/11/29 18: PASSED PASSED PASSED PASSED PASSED PASSED	27:48	1
	Geo Foc Co m Acc Fin RES	metry VESA Test: us VESA Test: bination Test: ess Test: ished at: ULT CODE:	PASSED Progress [30% Waiting Waiting 0000/00/00 00:0	00:00	
	Ela	psed Time:			<u>.</u>
				Stop 1	lests [Esc]
Total esti	mated time	: 00:00:04 of 00:02:18			
Navigation	[Arrows]		PgUp [F9]	PgDn [F10]	Home [Esc]

Figure 33: Display diagnostics execution

The Display Diagnostics Execution screen provides information about the Display diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

10 FAN

6

The Fan diagnostics is only available for ThinkPad systems

After the user enters the Fan option, the Algorithm Selection screen is displayed, as shown in the figure below.

\$	LENOVO	Diagnos	stics UEFI		707. Time	19:53 -	Version XX.XX.XXX
				FAN: FAN_SYSTEM			
				ALGORITHM SELECTION			
		[X] Select / Des	elect All Options			
		[
	Times to	Run					
	<< 1	> >>					
				Confirm [C]			
N	avigation	[Arrows]	Enter [Space]	Times to Run Info [T]			Home [Esc]

Figure 34: Fan algorithm seletion



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button. Consequently, the system will run all tests, as illustrated in the figure below.

LENOVO	Diagnost	ics UEFI		-1= 10	0 <mark>7.</mark> • 1	lime	06:33	- Versi	on XX.)	XX.XXX
			FAN							
	DIAGNOSTICS EXECUTION									
	Final Result FAN Sta Con Fin RES Ela	Code: rted at: trol Test: ished at: ULT CODE: psed Time:		2023/11/24 Progress [0000/00/00	06:34 5%1 00:00	: 24				
							Stop	Tests	[Esc]	
Total es	timated time:	00:00:05 of 00:0	02:00							
Navigatio	m [Arrows]								Home	[Esc]

Figure 35: Fan diagnostics execution

The Fan Diagnostics Execution screen provides information about the fan diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

- Final Result Code (an encrypted code that informs which modules were tested).
- Date and time that diagnostic has started.

- Test (name of the test being currently run).
- · Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

The dual fan support was added on v04.06.000 version.

11 Keyboard

The user can choose between PS/2 or USB keyboard as is shown in the figure below.

LENOVO	Diagnostics	uef i			- - - 100×	Time 00:00 - Ve	rsion XX.XX.XXX
			KEY	BOARD			
			DEVICE	SELECTION			
	[X] :	Select / De	eselect All O	ptions			
	[X]] [X] [PS/2 Keyboa JSB Keyboar	ard cd				
			C				
			Conti				
Navigatio	n [Arrows]	Enter	[Space]				Home [Esc]

Figure 36: Keyboard type selection

After the selection of the desired keyboard, the user can select the tests for the selected keyboard type:

- PS/2 Test:
 - **Description:**"*PS/2 Test*" is a keyboard test that checks the access to *PS/2* type keyboards.
 - Results: PASSED; FAILED; CANCELED; NOT APPLICABLE.
- USB Test:
 - **Description:**"USB Test" is a keyboard test that checks the access to USB type keyboards.
 - Results: PASSED; FAILED; WARNING¹; CANCELED; NOT APPLICABLE.
 - * 1: This test presents similar behavior to USB keyboard Test from Lenovo Diagnostics Windows, consequently, the WARNING test result is given when some information is not retrieved.
 - * Warning Message (when some information is not retrieved): WARNING Manufacturer or Machine Type-Model (MTM) was not possible to be retrieved
- ・Key Test:
 - Description:"Key Test" is an attended keyboard test that the user can check whether the keys and existing LEDs are properly working for PS/2 Keyboards or USB Keyboards.

- Results: PASSED; FAILED; CANCELED.

LENOVO	Diagnostics	s UEFI			- - - 100×	Time 00	:00 - Vers	ion XX	.xx.xxx
			KEYE	IOARD					
			ALGORITHM	SELECTION					
	[×] [×]	Select / D PS/2 Test Key Test	eselect All O	ptions					
Times to Run ≪ < 1 >>>									
			Conf i	rm [C]					
Navigation	[Arrows]	Enter	[Space]					Home	[Esc]

Figure 37: Keyboard algorithm selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

LENOVO	Diagnostics UEFI	37% Time 13:04 - Version XX.XX.XXX						
	KEY TI	EST: PS/2 Keyboard						
	Press any key on yo	ur keyboard in order to test it						
(F11) (LE	FT_ALT] (LEFT_ALT] (F11) (LEFT_CONT	ROLJ						
Esc	F1 F2 F3 F4 F5 F6 F7 F	8 F9 F10 F11 F12 ScL NuL CpL ScL						
` 1	2 3 4 5 6 7 8 9	0 - = BckSpc Ins Hom PUp NL / * -						
Tab	Q W E R T Y U I	0 P [] \ Del End PDm 7 8 9						
CLock	A S D F G H J K	L ; ' Enter 4 5 6						
LShift	Z X C V B N M ,	. / RShift // 1 2 3						
Ctrl W	in Alt	Alt Win Menu Ctrl < \/ > 0 Del						
Notes: 1	o test Ctrl, Shift or Alt, press	s the referred key + any function key (e.g.: Alt+F1)						
To test Caps, Num or Scroll Lock, press the referred key + any character key (e.g.: CapsLock+A)								
	To test Win key, press the refer	red key + any modifier key (e.g.: Win+Shift)						

Press [Esc/F3] three times to exit the test

Figure 38: Keyboard key test execution



When there is only one device available, the device number is not going to appear on the device's name.

After the keyboard test execution, the screen below is displayed with the test results.

LENOVO 🎙 Diagnost	ics UEFI		<mark>63%.</mark>	Time	14:15 -	Version XX.	XX.XXX
		KEYB	DARD				
		DIAGNOSTICS	EXECUTION				
Final Result	t Code:	U14G1PV71-C7UCXE					T
PS/2 Keyboar	rd						
Exe Sta Ke <u>u</u> Fir	ecution N urted at:) Test: hished at	umber: 1 	2023/11/10 14: PASSED 2023/11/10 14-	16:13 16:16	View	Log [V]	
Total estimated time	: 00:00:0	5 of 00:02:00					
Navigation [Arrows]			PgUp [F9]	Pg	Dn [F10]	Home	[Esc]

Figure 39: Keyboard diagnostics execution

Note

i

- Keyboard attended test will automatically exit and show a popup asking if s/he wants to exit the test after 15 seconds of no user interaction.
- Test Keyboard displayed layout may differ from physical device depending on system model.

12 Memory

The system allows the user to access the Memory diagnostics from the Home screen, Diagnostics, Memory.

After the user enters the Memory option, the memory diagnostics type menu will be displayed and user can choose between quick and extended diagnostics.

LENOV	Diagnostic	s UEF I			- - - 100×	Time 00:00 - 1	Jersion XX.XX.XXX
			MEMOR	Y			
			DIAGNOSTIC	S TYPE			
		Quick Extended					
					-		
			Confirm	[C]			
Naviga	tion [Arrows]	Enter	[Space]				Home [Esc]

Figure 40: Memory diagnostic type

Intel's Tiger Lake processor platform has a feature called TME (Total Memory Encryption) that enables the encryption of the whole physical memory of a system. This feature can usually be enabled via BIOS menu in compatible systems. The encryption of memory can cause the memory diagnostics to present inaccurate results. If the application detects that TME is enabled it will display this popup:

•	LENOVO	Diagnostics UEFI		 1 00× Time 00:00 - U	ersion XX.XX.XXX
			MEMORY - QUI	СК	
I					
	Fin	al Result Code:			
	MEM	THE C	Total Memory Encrypt	ion) is Enabled	
		TME is enabled, ple results may not be	ase disable it in BI accurate. Do you wis	OS options, otherwise test h to continue the test?	
		No (Esc	1	Yes	
	Total estima	ted time: 00:00:00 of	00:19:50	Stop Te	sts [Esc]
	Navigation	[Arrows]			Home [Esc]

Figure 41: Memory diagnostic TME pop-up

If the user does not answer the popup in 15 seconds, the test will automatically start.

12.1 Memory quick diagnostics

The system allows the user to access the memory quick diagnostics from the Home screen, Diagnostics, Memory.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. The quick diagnostics is selected by default upon selecting the memory module. To access the memory quick diagnostics, the user can use the UP/DOWN arrow key until "Quick" is focused and press SPACE key to select it.

After the user enters the Memory Quick Diagnostics option, the Algorithm Selection screen is displayed, as shown in the figure below.

	LENOVO	Diagnos	stics UEFI		73%	Time	19:48	-	Version XX.XX.XXX
				MEMORY : MAIN_MEMORY					
				ALGORITHM SELECTION					
		[X] Select / De	select All Options					
		ſ	X] Quick Randor	n Pattern Test					
	Times to <<< 1	Run							
				Confirm [C]					
Nav	igation	[Arrows]	Enter [Space]	Times to Run Info [T]					Home [Esc]

Figure 42: Memory quick diagnostics



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

The Memory Quick Diagnostics Execution screen is shown in the figure below.

LENOVO	Diagnost	ics UEFI	-1= 100	<mark>97.</mark> ∎ Time	06:34 -V	ersion XX.X	XXXXX			
MEMORY – QUICK										
	DIAGNOSTICS EXECUTION									
	Final Result MEMORY Sta All Qui Dea Fin RES Ela	: Code: rted at: ocating Memory Step: ck Random Pattern Test: llocating Memory Step: jished at: ULT CODE: psed Time:	2023/11/24 0 DONE Progress [1 Waiting 0000/00/00 0	96:34:49 17 1 90:00:00						
					Stop Te	sts [Esc]				
Total es	timated time	: 00:00:10 of 00:11:20				_				
Nav igat io	n [Arrows]					Home	[Esc]			

Figure 43: Memory quick diagnostics execution

The system allows the user to access the memory quick diagnostics from the Home screen, Diagnostics, Memory.

The Memory Quick Diagnostics Execution screen provides information about the memory diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

- Final Result Code (an encrypted code that informs which modules were tested).
- QR Code (QR code shown on the right side of Final Result Code and that contain the information below, concatenated with semicolon):
 - Final Result Code;
 - Serial Number;
 - Test Date (YYYYMMDD format);
 - Machine Model;
 - BIOS Version;
 - UEFI Diags version;
 - Machine Type-Model (MTM);
 - Wired MAC Address (if not available, hide this information);
 - Wireless MAC Address (if not available, hide this information)
- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

12.2 Memory Extended Diagnostics

The system allows the user to access the memory extended diagnostics from the Home screen, Diagnostics, Memory.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. To access the memory extended diagnostics, the user can use the UP/DOWN arrow key until "Extended" is focused and press SPACE key to select it.

k	LENOVO	Diagnostics UEFI		-∎= 100≈∎ т	'ime 00:00 - Ver	sion XX.	xx.xxx
			MEMORY				
			DIAGNOSTICS TYPE				
		[] Quick [X] Extended					
			Confirm [C]				
N	avigation [f	Arrows] Enter [Space]				Home	[Esc]

Figure 44: Memory extended diagnostics

In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show a list of tests, as illustrated in the next figure, and all the tests are initially selected to be tested.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

LENOVO	Diagnostics UEFI	737.	Time	19:48	- Version XX.XX	.xxx
	MEMORY : MAIN_MEMORY					
	ALGORITHM SELECTION					
	[] Select / Deselect All Options]		
	[X] Advanced Integrity Test					
	[X] Bit High Test					
	[X] Bit Low Test [X] Walking Ones Right Test					
	[X] Walking Ones Left Test [X] Modulo 20 Test					
	[X] Moving Inversions 8bit Test					
	[X] noving inversions 32bit lest [X] Random Pattern Test					
	[X] Random Number Sequence Test [X] Block Move Test					
Times t ≪ < 1	o Run [] Bit Fade Test (~180 min) ▶▶>					
	Confirm [C]					
Navigation	[Arrows] Enter [Space] Times to Run Info [T]]			Home []	Esc]

Figure 45: Memory extended algorithm selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button. Consequently, the system will run all tests, as illustrated in the figure below.

\$	LENOVO	Diagnost	ics UEFI		- 1 = 41% •	Time 10:	27 - Vers	ion XX.	xx.xxx
				MEMORY	- QUICK				
				DIAGNOSTICS	EXECUTION				
		Final Result	: Code:	U1927M983-7KH5T3					T
		MEMORY							
		Sta All Qui Dea	rted at: ocating ck Rando llocatin	Memory Step: m Pattern Test: « Memory Step:	2023/11/10 10:2 DONE CANCELED DONF	7:50			ł
							View Log	[V]	
	lotal es	timated time:	: 00:00:0	2 of 00:11:20					
N	avigatio	n [Arrows]			PgUp [F9]	PgDn	[F10]	Home	[Esc]

Figure 46: Memory extended algorithm execution

The Memory Extended Diagnostics Execution screen provides information about the memory diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - **NOT APPLICABLE**, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).



For memory diagnostics there is an additional step to allocate and deallocate memory, where the deallocate step cannot be canceled as the test cannot keep memory allocated.

12.3 Memory logs - failed address listing

If the execution of memory tests end up returning a FAILED status during tests, the application will make available, on the result logs, the memory addresses where errors were encountered, as well as the values that were written, and what was actually read from them.

```
START TESTS
20230825T115318UTC MESSAGE TESTED_SIZE: 8,004 MB
20230825T115318UTC START ADVANCED_INTEGRITY
20230825T115319UTC ERROR ADDRESS: 0x1B002A718
20230825T115319UTC ERROR WROTE 0x0, READ 0x1000
20230825T115319UTC STOP ADVANCED_INTEGRITY FAILED 1 S
20230825T115320UTC START ADDRESS_TEST
20230825T115321UTC ERROR ADDRESS: 0x1B002A718
20230825T115321UTC ERROR WROTE 0x1B002A718, READ 0x1B002B718
20230825T115321UTC STOP ADDRESS TEST FAILED 1 S
20230825T115321UTC START HIGH BIT
20230825T115322UTC ERROR ADDRESS: 0x1B002A728
20230825T115322UTC STOP HIGH BIT FAILED 1 S
20230825T115322UTC START LOW BIT
20230825T115323UTC ERROR ADDRESS: 0x1B002A718
20230825T115323UTC ERROR WROTE 0x0, READ 0x1000
20230825T115323UTC STOP LOW_BIT FAILED 1 S
20230825T115323UTC START WALK ONE BIT RIGHT
20230825T115324UTC ERROR ADDRESS: 0x1B002A718
20230825T115324UTC ERROR WROTE 0x800000000000000, READ 0x8000000000000000
20230825T115324UTC STOP WALK ONE BIT RIGHT FAILED 1 S
20230825T115324UTC START WALK_ONE_BIT_LEFT
20230825T115325UTC ERROR ADDRESS: 0x1B002A718
20230825T115325UTC ERROR WROTE 0x1, READ 0x1001
20230825T115325UTC STOP WALK_ONE_BIT_LEFT FAILED 1 S
20230825T115325UTC START MODUL0_20
20230825T115439UTC ERROR ADDRESS: 0x1B002A718
20230825T115439UTC ERROR WROTE 0xAE120F7036806C67, READ 0xAE120F7036807C67
20230825T115439UTC STOP MODULO_20 FAILED 74 S
20230825T115439UTC START MOVING_INVERSIONS_8BIT
20230825T115440UTC ERROR ADDRESS: 0x1B002A718
20230825T115440UTC ERROR WROTE 0x8080808080808080, READ 0x808080808080809080
20230825T115440UTC STOP MOVING INVERSIONS 8BIT FAILED 1 S
20230825T115440UTC START MOVING_INVERSIONS_32BIT
20230825T115442UTC ERROR ADDRESS: 0x1B002A718
20230825T115442UTC ERROR WROTE 0x100000000, READ 0x100001000
20230825T115442UTC STOP MOVING INVERSIONS 32BIT FAILED 2 S
20230825T115442UTC START RANDOM_PATTERN_TEST
20230825T115443UTC ERROR ADDRESS: 0x1B002A728
20230825T115443UTC ERROR WROTE 0xE740468D24F217D9, READ 0xE740468D24F207D9
20230825T115443UTC STOP RANDOM_PATTERN_TEST FAILED 1 S
20230825T115443UTC START RANDOM_NUMBER_SEQUENCE
20230825T115451UTC ERROR ADDRESS: 0x1B002A738
20230825T115451UTC ERROR WROTE 0xCA84C33F8E509A66, READ 0xCA84C33F8E508A66
20230825T115451UTC STOP RANDOM_NUMBER_SEQUENCE FAILED 8 S
20230825T115451UTC START BLOCK_MOVE_TEST
20230825T115645UTC ERROR ADDRESS: 0x1B002A738
20230825T115645UTC ERROR WROTE 0xCA84C33F8E509A66, READ 0xCA84C33F8E508A66
20230825T115645UTC STOP BLOCK_MOVE_TEST FAILED 114 S
STOP TESTS UME000003VV000003VV-7J7C5J
```

Figure 47: A log with memory addresses available

13 Motherboard

The system allows the user to access the motherboard diagnostics from the Home screen, Diagnostics, Motherboard.

After the user enters the Motherboard option, the Algorithm Selection screen is displayed, as shown in the figure below.

\$	LENOVO	Diagnos	stics U	EFI			<mark>707.</mark> •	Time	19:54	-	Version XX.XX.XXX
				MC	THERBOARD :	MAIN_MOTHER	BOARD				
					ALGORIT	IM SELECTION	l				
		[X] Se	lect / De	select All	Options					
		[[X J Ch X J PC	ipset Tes [.] I/PCIe Te	t st						
		ſ	X] RT	C Test							
		ſ	X 1 US	B Test							
	Times to	Run > >>									
					Con	firm [C]					
N	avigation	[Arrows]	Enter	[Space]	Times to	Run Info [T]				Home [Esc]

Figure 48: Motherboard algorithm selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button. Consequently, the system will run all tests, as illustrated in the figure below.

LENOVO 📐 Diagnostics UEFI	<mark>60%</mark> •	Time 14:21 - Vers	ion XX.XX.XXX				
MOTHERBOARD							
DIAGNOSTICS	EXECUTION						
Final Result Code: U12W6LPEN-52RC1E			1				
MOTHERBOARD							
Started at: Chipset Test: RTC Test: Finished at:	2023/11/10 14:2 PASSED CANCELED 2023/11/10 14:2	1:55	1				
Total estimated time: 00:00:04 of 00:00:07		View Log	[Û]				
Navigation [Arrows]	PgUp (F9)	PgDn [F10]	Home [Esc]				

Figure 49: Motherboard diagnostics execution

The Motherboard Diagnostics Execution screen provides information about the motherboard diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - Progress (plus the test execution percentage), indicating the test is being run.
 - PASSED, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

14 Mouse

The system allows the user to access the mouse diagnostics from the Home screen, Diagnostics, Mouse.

When the user enters the Mouse option, a list of the available devices to be tested will be displayed.

LENOVO	Diagnostic	s UEFI		- - - 1 00×	Time 00:00 - Version XX.XX.XXX	
MOUSE						
DEVICE SELECTION						
	[×]] Select ∕ Deselect	All Options			
	[x] [x]	PS∕2 ∕ USB Mouse I2C Mouse				
Confirm [C]						
Navigatio	n [Arrows]	Enter [Space]			Home [Esc]	

Figure 50: Mouse device selection

After the user device selection, the Algorithm Selection screen is displayed, as shown in the figure below.
LENOVO	Diagnos	tics UEFI		-1:	17.	Time	11:44	– Ve	rsion XX.XX.XXX
	[2	MOUSE: l	JSB Mouse					
		•0	ALGORITHM	SELECTION					
	ſ	X] Select / Des	select All O	ptions]		
	I	X] Reset Test							
	[X] USB External	l Mouse Test						
Times to	Run > >>								
			Confi	rm [C]					
Navigation	[Arrows]	Enter [Space]	Times to R	un Info [T]					Home [Esc]

Figure 51: Mouse algorithm selection



List of tests that can be performed:

- Reset Test:
 - **Description:**"Reset Test" is a mouse test that resets the connection for both PS/2 and USB External type mouses.
- Mouse Test:
 - **Description:**"Mouse Test" is a mouse test that checks the access and move detection to PS/2 type mouses.
- USB External Mouse Test:
 - **Description:**"USB External Mouse Test" is a mouse test that checks the access and move detection to USB type mouse.

After the selection of the desired mouse type, the test begins as the screen below:



Figure 52: Mouse test execution PS/2



Figure 53: USB external mouse test



Figure 54: Mouse test execution I2C



When there is only one device available, the device number is not going to appear on the device's name.

LENOVO 📐 Diagnost	tics UEFI		517.	Time	14:35 -	Versio	on XX.>	XX.XXX
		MOL	ISE					
		DIAGNOSTICS	EXECUTION					
Final Result	t Code:	U1C36KNH1-M8C3H1						T
PS/2 Mouse								
Sta Res Mou Fin	arted at: set Test: ise Test: nished_at		2023/11/10 14:3 PASSED PASSED 2023/11/10 14:3	36:23 36:25				Ţ
					Vie	w Log	[V]	
Total estimated time	: 00:00:0	02 of 00:01:01				_		
Navigation [Arrows]			PgUp [F9]	Pg	Dn [F10]	1	Home	[Esc]

Figure 55: Mouse diagnostics execution

The Mouse Diagnostics Execution screen provides information about the memory diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

After the test finishes, a confirmation screen pop up to check if the test worked fine. After the confirmation, a screen with one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- A list with all the algorithms which compose device test and their respective status:
 - **PASSED**, indicating the algorithm has found no problems at device.
 - FAILED, indicating the user could interact with mouse device, but algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).



Note

Mouse attended tests will automatically exit after 15 seconds of no user interaction.

15 Optical

The system allows the user to access the optical diagnostics from the Home screen, Diagnostics, Optical. After the user accesses the Optical option, the application displays the number of algorithms that can be performed. If the diagnostic has more than one algorithm, Algorithm Selection screen is displayed, as shown in the figure below.

LENOVO	Diagnostic	s UEFI	- - = <mark>100∞</mark> ∎ Time Θ	9:00 - Version XX.XX.XXX
		OPTICAL: MAIN_OP	TICAL	
		ALGORITHM SELEC	TION	
	[×]	Select / Deselect All Options		
	[×]	MOST Test		
	[×]	Linear Seek Test		
	[×]	Random Seek Test		
	[×]	Funnel Seek Test		
	[X]	Read and Compare Test		
Times to Run ≪ < 1 ♪ ♪	3			
		Confirm [C]		
Navigation	n [Arrows]	Enter [Space]		Home [Esc]

Figure 56: Optical algorithm selection



At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be performed, the user can use the "Confirm" button. Consequently, the system will run all tests, as illustrated in the next figure.

LENOVO	Diagnostics UEFI	-8= 10	<mark>0≈</mark> ∎ Time 00:00 - Version XX.XX.XXX
		OPTICAL	
	DIAGNO	STICS EXECUTION	
	Final Result Code:		
	OPTICAL: DVDROM DA8DESH		
	Started at: MOST Test: Linear Seek Test: Random Seek Test: Funnel Seek Test: Read And Compare Test: Write Test: Finished at: RESULT CODE: Elapsed Time:	2022/11/29 19:29:0 Progress [0%] Waiting Waiting Waiting Waiting Waiting 0000/00/00 00:00:00	3
Total est	imated time: 00:00:04 of 00:15:00		Stop Tests (Esc)
Navigati	on [Arrows]		Home [Esc]

Figure 57: Optical diagnostics execution

The Optical Diagnostics Execution screen provides information about the optical diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Date and time that diagnostic has started.
- Number of the executed iteration.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- A list with all the algorithms which compose device test and their respective status, whereas an algorithm can have seven status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).

16 RAID

The system allows the user to access the RAID diagnostics from the Home screen, Diagnostics, RAID.

The purpose of this diagnostic is to find possible errors caused due to a malfunctioning in RAID controller. It will check just the RAID controller, not the HDD devices attached to it. The errors to be detected are the ones caused by fatal failures on PCI-e level, such as communication problems between the controller and the mainboard or even power failures.

It is possible to run tests for physical controllers and logical RAID controllers provided by Intel VROC/RST technologies.

Quick Diagnostics:

• Status Test;

- Slot Test;
- Link Test;
- Advanced Error Test.

Extended Diagnostics:

• Logical Device Read Test*.

*Test available only for machines that supports Intel Virtual RAID devices (VROC/RST) After the user enters the RAID option, the RAID diagnostics type menu will be displayed and user can choose between quick and extended diagnostics.

3	LENOVO	Diagno:	stics UEFI			- - - 100×	Time 00:00 -	- Version XX.XX.XXX
				RAID				
				DIAGNOSTICS	TYPE			
		[[[X] Quick] Extended					
				Confirm [c)			
Na	avigation	[Arrows]	Enter [Space]					Home [Esc]

Figure 58: RAID diagnostic type

16.1 RAID quick diagnostics

The system allows the user to access the RAID quick diagnostics from the Home screen, Diagnostics, RAID.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. The quick diagnostics is selected by default upon selecting the RAID module. To access the RAID quick diagnostics, the user can use the UP/DOWN arrow key until "Quick" is focused and press SPACE key to select it. After the user enters the RAID Quick Diagnostics option, the Algorithm Selection screen is displayed, as shown in the figure below.

\$	LENOVO	Diagnos	stics UEFI		-8= 1	00× Time 00:00	- Version XX.XX.XXX
				RAID 1: RAI	ID		
				ALGORITHM SELE	CTION		
		I	X] Select / Des	elect All Options	\$		
		נ נ נ	X] Status Test X] Slot Test X] Link Test X] Advanced Err	or Test			
	Times to << < 1	Run					
				Confirm [C]		
Na	avigation	[Arrows]	Enter [Space]	Times to Run In	fo [T]		Home [Esc]

Figure 59: RAID quick algorithm selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show a list of tests, as illustrated in the next figure, and all the tests are initially selected to be tested.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

At least one test must be selected so that the application can run the diagnostic. After the user chooses which tests will be performed, the user can press "Confirm" by pressing the ENTER key. Consequently, the system will run the tests, as illustrated in the following figure.

\$	LENOVO	Diagnost	ics UEFI			Time	14:03 -	Version	XX.XX.XXX
				RAID -	QUICK				
				DIAGNOSTICS	EXECUTION				
		Final Result	Code:	U1SKGFW8P-F5RKK7					î
		RAID							- 1
		Sta Sta Slo	rted at: tus Test: t Test: k Test:		2023/06/01 14: PASSED PASSED PASSED	:03:30	View	Log [M	
	Total es	timated time:	: 00:00:0	1 of 00:00:00			View	<u>rog</u> [v]	
N	avigatio	n [Arrows]			PgUp (F9)	Pg	,Dn (F10)	Но	me [Esc]

Figure 60: RAID quick diagnstics execution

The RAID Quick Diagnostics Execution screen provides information about the Physical RAID diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - PASSED, indicating the algorithm has found no problems at device.
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).

16.2 RAID extended diagnostics

The system allows the user to access the RAID extended diagnostics from the Home screen, Diagnostics, RAID.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. To access the RAID extended diagnostics, the user can use the UP/DOWN arrow key until "Extended" is focused and press SPACE key to select it.

After the user enters the RAID Extended Diagnostics option, the Algorithm Selection screen is displayed, as shown in the figure below.

•	LENOVO	Diagnostics	UEFI			100×	Time 00:00 - 1	Version XX.	xx.xxx
				RAID 1: F	RAID				
				ALGORITHM SE	LECTION				
		[×]:	Select ∕ Desel	ect All Optic	ons				
		[X] I	_ogical Device	Read Test					
	Times to Run	ו >							
				Confirm	[C]				
N	avigation [Ar	rows] Ente	er [Space] T	imes to Run	Info [T]			Home ([Esc]

Figure 61: RAID extended algorithm selection



An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show a list of tests, as illustrated in the next figure, and all the tests are initially selected to be tested.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

At least one test must be selected so that the application can run the diagnostic. After the user chooses which tests will be performed, the user can press "Confirm" by pressing the ENTER key. Consequently, the system will run the tests, as illustrated in the following figure.

\$	LEN0V0	Diagnost	ics UEFI			Time 14:03 – Ver	rsion xx.xx.xxx
				RAID - E	EXTENDED		
				DIAGNOSTICS	EXECUTION		
		Final Result	: Code:	U1TAD4PF5-W4WNCB			Ť
		RAID					
		Sta Log Fin RFS	rted at: ical Dev ished at	ice Read Test: :	2023/06/01 14:0 CANCELED 2023/06/01 14:0	14:07 14:08	1
						View Lo	g [V]
	Total es	timated time:	: 00:00:0	01 of 01:17:35			
N	avigatio	m [Arrows]			PgUp (F9)	PgDn [F10]	Home [Esc]

Figure 62: RAID extended diagnostics execution

The RAID Extended Diagnostics Execution screen provides information about the Virtual RAID diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - PASSED, indicating the algorithm has found no problems at device.
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).



Note

On JSON logs, the actual volume name for each RAID partition will be available

17 Storage



Storage devices connected as RAID will not be detected by UEFI diagnostics application, therefore they can not be tested.

The system allows the user to access the storage extended diagnostics from the Home screen, Diagnostics, Storage.

After the user enters the Storage option, the storage diagnostics type menu will be displayed as the following image.

LENOVO	Diagnostic	s UEF I			- - - 100×	Time 00:00 -	Version XX.XX.XXX
			STOR	AGE			
			DIAGNOSTI	CS TYPE			
		Quick Extended					
					-		
			Confir	n [C]			
Navigatio	on [Arrows]	Enter	[Space]				Home [Esc]

Figure 63: Storage diagnostics type

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it.

After the user enters the "Confirm" button, the application will display the number of storage devices available in the system. If there is more than one storage device installed, the menu Device Selection is displayed, as shown in the next figure.

LENOVO	Diagnostics	UEFI		- - = 100×	Time Θ	9:00 - Ver	sion XX.XX.XXX
			STORAGE				
		DEV	VICE SELECTIO	IN			
	[X]	Select / Deselect (All Options				
	[X] (MIS RPITJ256PED2H	₩X-Phison Ele	ectronics C	Corp.	(I)	
				_			
			Confirm [C]				
Navigatio	n [Arrows]	Enter [Space]		Selected	lten Info	[1]	Home [Esc]

Figure 64: Storage device selection

This screen also allows seeing devices details. To access this feature, the user has to press the I key when the desired device is focused, leading to the exhibition of a popup with the device information, as shown in the subsequent figure. (The 8s code will only be shown when supported.)

LENOVO Diagnostics UEFI - I 1000 Time 00:00 - U	Jersion XX.XX.XXX
STORAGE	
DEVICE SELECTION	
[X] Select / Deselect All Options	
STORAGE INFORMATION	
Display Name: KBG5AZNT1T02 LA KIOXIA-Kioxia Corporation Manufacturer: Kioxia Corporation Device Type: NVMe Serial Number: X1NC302QE725 8S Code: 8SSSS0L24798XXXX1AP015W Size: 953 GB	
Ok	
Confirm [C]	
Navigation [Arrows] Enter [Space] Selected Item Info []]	Hone [Esc]

Figure 65: Storage device information pop-up

17.1 Storage quick diagnostics

The system allows the user to access the storage quick diagnostics from the Home screen, Diagnostics, Storage.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. To access the storage quick diagnostics, the user can use the UP/DOWN arrow key until "Quick" is focused and press SPACE key to select it.

In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show a list of tests, as illustrated in the next figure, and all the tests are initially selected to be tested.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

LEN0V0	Diagnostic	s UEF I	- 100% Time 00:00 - Version XX.XX.XXX
	STO	DRAGE 1: UMIS RPITJ256PED2MWX-Ph	ison Electronics Corp.
		ALGORITHM SELECT	TION
	[X]	Select / Deselect All Options	
	[X]	l Device Read Test	(i)
	[X]	NVMe Read Test	GD
	[×]	NVMe Short Self-Test	GD
	[X]	NVMe Controller Status Test	GD
	[X]	I N∀He SMAR⊺ Temperature Test	GD
	[X]	NVHe SMART Spare Space Test	GD
	[X]	INVMe SMART Reliability Test	GD
Times	to Run		
<< < 1	> >>		
		Confirm [C]	
Navigati	on [Arrows]	Enter [Space]	Selected Item Info [1] Home [Esc]

Figure 66: Storage quick algorithm selection for NVMe devices

¥	LENOVO Dia	agnostics	UEFI			- - = <mark>100×</mark> =	Time 00:00	- Version XX.XX.XXX
			STORAGE 1: S	T2000LM007-1R8	174–Seagate	Technolog	у	
				ALGORITHM SE	LECTION			
		[X]	Select / Des	elect All Opti	ons			
		[X]	SMART Status	: Test			(i)	
		[X]	SMART Short	Self-Test			(i)	
		[X]	Drive Self–T	est			(i)	
		[X]	Random Seek	Test			(i)	
		[X]	Funnel Seek	Test			(i)	
		[X]	Target Read	Test			(i)	
	Times to Run							
	$\langle \langle 1 \rangle \rangle \rangle$							
				Confirm	[C]			
N	avigation [Arro	ws] Ent	er [Space]	Times to Run	Info [T]	Selected I	tem Info [I] Home [Esc]

Figure 67: Storage quick algorithm selection for HDD devices

LENOVO	Diagnos	stics UEFI				Tin	ne 12:35 ·	- Versi	on XX.XX	.xxx
		\$	storage 1	: THGJFHTO)T44BATLB-K	IOXIA				
			A	LGORITHM S	ELECTION					
	Ĺ	X] Select	/ Deseled	ct All Opti	ions					
	ſ	X] Device F	Read Test	t			(i)			
Times to D	Zun									
<< < 1 >	>>									
				Confirm	[C]					
Navigation [4	Arrows]	Enter [Spac	æ] Tir	mes to Run	Info [T]	Selected	ltem Info	[1]	Home [I	Esc]

Figure 68: Storage quick algorithm selection for UFS devices



At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be tested, the user can use the "Confirm" button. It will start the diagnostic, as demonstrated in the next figure.

LENOVO	Diagnost	ics UEFI	-== 100%	Time	06:34	- Versio	on XX.X	X.XXX
		STORAGE	- QUICK					
		DIAGNOSTICS	EXECUTION					
Fin Stri Ser 85	nal Result DRAGE: SAM rial Numbe Code: 8SS Sta Dev NVM NVM NVM NVM NVM NVM NVM Fin RES	: Code: ISUNG M2ULB256HBHQ-000L7 er: S4ELNE0KC01275 ISS0L2515461KA8CU00BM rted at: ice Read Test: e Read Test: e Short Self-Test: e Short Self-Test: e SMART Temperature Test: e SMART Temperature Test: e SMART Reliability Test: ished at: ULT CODE:	2023/11/24 06:3 Progress [39% Waiting Waiting Waiting Waiting Waiting Waiting Waiting 0000/00/00 00:0	5:14] 0:00		•		Ĩ
					Stop	Tests	[Esc]	
Total estim	ated time	: 00:00:04 of 00:08:24						
Navigation [Arrows]		PgUp [F9]	Pg	rDn [F1	0]	Home	[Esc]

Figure 69: Storage quick diagnostics execution for NVMe devices

LENOVO	Diagnostics UEFI	-8= 🛙	082 Time 00:00 ·	- Version XX.XX.XXX
	STDR	AGE – QUICK		
	DIAGNOST	ICS EXECUTION		
				1
	Final Result Code:			
	STORAGE: ST2000LM007-1R8174			
	Serial Number: WDZM5LWR			_
	8S Code: 8SSHD0P03179S1CW97E0049			_
	Started at:	2023/04/03 16:4	7:56	
	SMART Status Test:	PASSED		
	SMART Short Self-Test:	Progress [0%]		
	Drive Self-Test:	Waiting		
	Random Seek Test: Funnel Seek Test:	Waiting		
	Target Read Test:	Waiting		
	Finished at:	0000/00/00 00:00	0:00	
	RESULT CODE:			
				1
			Stop Tes	sts [ESC]
Total est	imated time: 00:00:02 of 00:06:04			
Navigation	n [Arrows]	PgUp [F9]	PgDn (F10)	Home [Esc]

Figure 70: Storage quick diagnostics execution for HDD devices

LENOVO	Diagnost	ics UEF1			Time	12:35 - Versi	on XX.XX.XXX
			STORAGE -	QUICK			
			DIAGNOSTICS EX	XECUTION			
Fi St	inal Result TORAGE: THG erial Numbe Sta Dev Fin RESI Elaj	Code: JFHT0T44BAILB r: 7WXUY95960 rted at: ice Read Test: ished at: JLT CODE: psed Time:		2023/05/16 Progress [0000/00/00	12:35:30 7%] 00:00:00		
						Stop Tests	[Esc]
Total esti	mated time:	00:00:03 of 00	:03:00				
Navigation	[Arrows]						Home [Esc]

Figure 71: Storage quick diagnostics execution for UFS devices



The tests availability relies on UEFI protocols in order to be available for the selected device.

The Storage Quick Diagnostics Execution screen provides information about the storage diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

- Final Result Code (an encrypted code that informs which modules were tested).
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - **FAILED**, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - **NOT APPLICABLE**, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).

17.2 Storage extended diagnostics

The system allows the user to access the storage extended diagnostics from the Home screen, Diagnostics, Storage.

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. To access the storage extended diagnostics, the user can use the UP/DOWN arrow key until "Extended" is focused and press SPACE key to select it.

In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show a list of tests, as illustrated in the next figure, and all the tests are initially selected to be tested.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

LENOVO	Diagnostic	s UEF I	-== 10	<mark>00×</mark> ∎ Time 00:00 - Ve	rsion XX.XX.XXX					
	STO	RAGE 1: UMIS RPITJ256PED	2MWX-Phison Elect	ronics Corp.						
		ALGOR I THH	SELECTION							
	[X]	Select / Deselect All O	ptions							
	[X]	Bad Block Test		(I) (I)						
	[*]	NYIE EXTENDED SETT TEST								
Times to	Due									
< < 1	> >>									
	Confirm [C]									
Navigation	n [Arrows]	Enter [Space]	Selected	Item Info [1]	Home [Esc]					

Figure 72: Storage extended algorithm selection for NVMe devices

•	LENOVO	Diagno	stics UEFI			- - - 100×	Time 00:00	- Version XX	
			STORAGE 1: S	T2000LM007-1R8	174–Seagat	e Technolog	.y		
				ALGORITHM SE	ELECTION				
		[[X] Select / Des						
		[[[X] Bad Block Te [X] Linear Read	est Test			(i) (i)		
	Times to	Run > >>							
				Confirm	[C]				
N	avigation	[Arrows]	Enter [Space]	Times to Run	Info [T]	Selected]	(tem Info	[I] Home	[Esc]

Figure 73: Storage extended algorithm selection for HDD devices

LENOVO	D i agno:	stics UEFI			k	tin	ne 12:49	i – Ver	sion XX.	.xx.xxx
			STORA	GE 1: THGJFHTO	T44BA ILB-k	(10X1A				
				ALGORITHM SI	ELECTION					
	[X] Select	/ Des	elect All Opti	ons					
	r	X] UFS Rea	nd Test	t			G)		
				-						
Times to	Run									
<< < 1	> >>									
				Confirm	[C]					
Navigation	[Arrows]	Enter [Spa	ce]	Times to Run	Info [T]	Selected	Item In	fo [1]	Home	[Esc]

Figure 74: Storage extended algorithm selection for UFS devices



At least one test must be selected, so that the application can run the diagnostic. After the user chooses which tests must be tested, the user can use the "Confirm" button. It will start the diagnostic, as demonstrated in the next figure.

LENOVO Diagnostics UEFI	-1= 17.	Time 11:44 - Ver	sion XX.XX.XXX
STORAGE -	EXTENDED		
DIAGNOSTICS	EXECUTION		
Final Result Code: STORAGE: UMIS RPJTJ256MGE1QDQ Serial Number: SSOL25209X1RC19610B2 8S Code: 8SSSS0L25209X1RC19610B2 Started at: Bad Block Test: NVMe Extended Self-Test: Finished at: RESULT CODE: Elapsed Time:	2023/11/22 11:4 Progress [0%] Waiting 0000/00/00 00:0	4:35 0:00	Ť
_		Stop Test:	s (Esc)
Total estimated time: 00:00:01 of 00:19:00			
Navigation [Arrows]	PgUp (F9)	PgDn [F10]	Home [Esc]

Figure 75: Storage extended dignostics execution for NVMe devices

ł	LENOVO Diagnos	tics UEFI			- = 100×	Time 00:00 - V	ersion XX.	xx.xx
			STORAGE - E	EXTENDED				
			DIAGNOSTICS E	XECUTION				
					16			T
	STORAGE: ST Serial Numb 8S Code: 85	72000LM007–1R8174 ber: WDZM5LWR SSHD0P03179S1CW970	E0049					I
	St Ba Li Fi RE	arted at: Wd Block Test: Inear Read Test: Inished at: ISULT CODE:		2023/04/03 CANCELED CANCELED 2023/04/03 UHD000000	16:48:20 16:48:22	2 2 00-NJSYQF		1
	EI	apsed Time: 00:0	00:02					
								Ŧ
						View Lo:	s [V]	
	Total estimated tim	e: 00:00:02 of 12	:05:20					
N	avigation [Arrows]			PgUp [F9]		PgDn [F10]	Hone	[Esc]

Figure 76: Storage extended dignostics execution for HDD devices

4	LEN0V0	Diagnostics UEFI	-8	= <mark>100×</mark> ∎ Time 00:00 - Version XX.XX.3	xx
			STORAGE - EXTENDED		
		DI	AGNOSTICS EXECUTION		
					t
		STORAGE: ST2000LM007-1R8174 Serial Number: WDZM5LWR 8S Code: 8SSHD0P03179S1CW97E00	49		l
		Started at: Bad Block Test: Linear Read Test: Finished at: RESULT CODE:	2023/04/03 16 CANCELED CANCELED 2023/04/03 16 UHD000000000	;:48:20 ;:48:22 ;:0000000-NJSYQF	
		Elapsed Time: 00:00:	02		
					Ŧ
				View Log [V]	
	Total es	timated time: 00:00:02 of 12:05	:20		
N	av igat io	n [Arrows]	PgUp (F9)	PgDn (F10) Home (Esc	:]

Figure 77: Storage extended dignostics execution for UFS devices

The Storage Extended Diagnostics Execution screen provides information about the storage diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).

18 Touch

The system allows the user to access the touch diagnostics from the Home screen, Diagnostics, Touch. After the user accesses the Touch option, the application displays the number of algorithms that can be performed. If the diagnostic has more than one algorithm, Algorithm Selection screen is displayed:

LENOVO	Diagnostics UEFI		99% T	'ime 08:00 -	Version XX.XX.XXX
	T	DUCH: I2C Touch Panel			
		ALGORITHM SELECTION			
	[X] Select / Desel	ect All Options			
	[X] Reset Test				
	[X] Grid Test				
Times to Ru ≪ < 1 >>	ו ≥			ß	
		Confirm [C]			
Navigation [Ar	rows] Enter [Space] T	imes to Run Info [T]			Home [Esc]

Figure 78: Touch algorithm selection

• Reset Test:

i

- **Description:**"*Reset Test*" *is a touch device test that resets the connection with touch device.*
- Grid Test:
 - **Description:**"Grid Test" is a touch device test that tracks all touch events on touch device.

On Grid test, a popup is show asking the user to touch the screen in all points to test if it is working correctly.



Figure 79: Grid test starting pop-up

After the test finishes, a confirmation screen pop up to check if the test worked fine.

GRID TEST Did the touch screen work correctly? No [Esc] Yes
Did the touch screen work correctly? No [Esc] Yes
No [Esc] Yes

Figure 80: Grid test ending pop-up

After the confirmation, it will start the diagnostic, as demonstrated in the next figure.
LENOVO	Diagnost	ics UEFI		-1=	100×	Time 00:00	- Vers	ion XX.	.xx.xxx
			TOUC	Н					
			DIAGNOSTICS F	XECUTION					
									Ť
	Wacom Co.,Lt	dPen and m	multitouch sensor						
	Sta Res Gria Fin RES	rted at: et Test: d Test: ished at: ULT CODE:		2022/11/30 00 PASSED PASSED 2022/11/30 00 UTS0000001800	:31:52 :31:58 0000000	-717W5F			l
	Ela	psed Time:	00:00:06						
									Ţ
						View	Log	(V)	rd'
Total est	imated time:	00:00:06 of	f 00:01:05						
Navigation	n [Arrows]			PgUp [F9]	Р	gDn (F10)		Home	(Esc)

Figure 81: Touch diagnostics execution

The Touch Diagnostics Execution screen provides information about the Touch diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- A list with all the algorithms which compose device test and their respective status:
 - **PASSED**, indicating the algorithm has found no problems at device.
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - **NOT APPLICABLE**, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC (or F3 for Grid test) key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).



Note

Touch grid test will automatically exit after 15 seconds of no user interaction.

19 Wired ethernet



The wired ethernet module is currently only available for the Bootable version of UEFI.

The system allows the user to access the Wired Ethernet from the Home screen, Diagnostics.

The user can deselect a selected test by pressing the SPACE key when the test is highlighted. An empty space will appear between the brackets. To select a test again, the user can press the SPACE key again.

Initially, the "Select/Deselect All Options" is selected. If the user presses the SPACE or ENTER key on that option, then all test options will be deselected. If the user selects the "Select/Deselect All Options" again, all tests options will be selected again.

ł	LEN0V0	Diagnostics	UEFI			- - - 100×	Time 00:00 -	Version X	x.xx.xxx
				WIRED ET	н				
				DEVICE SELE	CTION				
		[X]	Select ∕ Desel	ect All Optio	ns				
		[X] [X]	Wired Ethernet Wired Ethernet	Adapter Adapter					
		[X]	wired Ethernet Wired Ethernet	наартег Adapter					
				Confirm [[C]				
N	avigation [Arrows] Ente	er [Space]					Home	[Esc]

Figure 82: Wired ethernet device selection

In case the test is executed using an Ethernet dongle (or adapter) the following popup message will be shown:



Figure 83: Internet connection test's dongle warning

\$	LEN0V0	Diagno	stics UEF	I			- - = <u>100×</u> •	Time 00:00 -	- Version XX.XX.XXX
				WIRED ET	THERNET 1: Wir	ed Ethernet	Adapter		
					ALGORITHM S	ELECTION			
		[[X] Sele	ect / Des	select All Opt	ions			
		[X] Inte	ernet Cor	nnection Test				
	Times to	Run							
					Confirm	n [C]			
N	avigation	[Arrows]	Enter	[Space]	Times to Run	Info [T]			Home [Esc]

Figure 84: Wired ethernet algorithm selection



If more than one device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

Upon selecting the test to be executed, the user will be met with a pop-up asking the user if the ethernet cable is connected.

ł	LENOVO	Diagnostics UEFI		- = 50%	Time 04:14 - Ve	ersion XX.XX.XXX
			UIRE	D ETH		
ľ			DIAGNOSTICS	EXECUTION		
ľ						
		Final Result Code:				
I		Vired Ethernat Adapta				-
I			INTERNET CON	NECTION TEST		
I						
I			Is the ethernet	cable connected?		
I						
		Cancel	[Esc]	Ok		
I						-
I						
I						
l	_				Ston Test	e (Fec)
	lotal es	tinated time: 88:00:00	of 88:88:48		Stop Test	
	iotal es	(Asses)	01 00.00.10			United (Const
N	av igatio	n URrrowsJ				Home [Esc]

Figure 85: Internet connection test's pop-up

After closing the pop-up, the application Internet Connection Test is going to check if the Ethernet device has a connection and it is going to send and receive packets. If the diagnostic has only one device, it will be started, as shown in the next figure.

LENOVO	Diagnost	ics UEFI	:		Time 08:04 - Vers	ion XX.XX.XXX
			WIRED	ETH		
			DIAGNOSTICS	EXECUTION		
	Final Result	Code:	U1PAGDR2J-242KJ1		回該政務部務	1
	Wired Ethern	et Adapi	ten			
	Sta Int Fin RFS	rted at: ernet Co ished at	nnection Test: :	2023/11/22 08:0 WARNING 2023/11/22 08:0	4:12 4:18 00000-NTSWOG	1
T A A					View Log	[V]
Total es	timated time:	: 00:00:	06 of 00:00:40			
Navigatio	in [Arrows]			PgUp [F9]	PgDn [F10]	Home [Esc]

Figure 86: Wired ethernet diagnostics execution

The Wired Ethernet Diagnostics Execution screen provides information about the Wired Ethernet diagnostics progress, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

• Final Result Code (an encrypted code that informs which modules were tested).

- The number of the executed iteration
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - CANCELED, indicating the algorithm has been canceled by user.
 - **NOT APPLICABLE**, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).



Note

If there is more than one device in the system, the screen below will be displayed

20 WiFi



WiFi Diagnostic is available on embedded version only and depend on WiFi UEFI Drivers availability.

The system allows the user to access the WiFi diagnostics from the Home screen, Diagnostics, WiFi. After the user accesses the WiFi option, the application will display the available WiFi tests:

• Scan Test:

- **Description:**"Scan Test" scans for nearby WiFI Networks.



If more than one audio device is available, the selected device will be shown accompained by it's number, on the algorithm selection screen

After the test is executed, the application will display the execution result screen as in the image below:



Figure 87: WiFi diagnostics execution

In the result log, the found WiFi networks are listed.

Scan test, an unattended test that will search for available WiFi networks

- If one or more networks are found:
 - The rest result will be **PASSED**
- If the sensor does not detect any WiFi network
 - The test result will be WARNING
- · If any error occurs when accessing the device and scanning for networks
 - The test result will be FAILED
- If the user press [Esc]
 - The test will be CANCELED
- If the test can not be executed the test result will be NOT APPLICABLE.

21 Run All

The system allows the user to access the run all diagnostics from the Home screen, Diagnostics, Run All.

An item can be selected/deselected by pressing SPACE when it is highlighted. To access a diagnostics type, the user can use the UP/DOWN arrow key until the desired item is focused and press SPACE key to select it, as illustrated in the figure below.

÷	LENOVO	Diagnostics	5 UEFI		- - - - - 1 00×	Time 00:00 - U	ersion XX.XX.XXX
				RUN	ALL		
				DIAGNOST	ICS TYPE		
		Quick (Unattended) [Q] Quick [W] Full (Unattended) [E]		Quick Exclue more f e.g.l This f Full: Inclue WARNIN	tes extended tests of mo than 10 minutes to compl Extended tests of CPU, M test mode takes about 15 les all quick and extend MG: This test mode can t molete.	odules that t lete each tes Memory and St 5 minutes to led tests of take several	ake st. corage. complete. modules. hours
		Full [R]	1	Unatte Test r user : e.g. l	ended: node that excludes tests interaction. Nouse, Keyboard, Touch,	s that need etc.	
	Times to Run ≪ < 2 > >>		Times Speci: Maxim	to Run: fies number of times tes um of 5 repetitions.	sts will be r	repeated.	
	Navigat	ion [Arrows]	Enter	[Space]			Home [Esc]

Figure 88: Run All diagnostic type

After the user selects one option of the run all modes, the application will display the entire set of modules of the UEFI Diagnostic application as follows:

• If a module is unavailable, the module will display as **Not Found**.

Quick (Unattended) [Q]:

- If a module has only attended tests, it will be displayed as Not Selected
- If a module has only extended tests, it will be displayed as Not Selected
- Attended tests will be displayed as **Not Selected** and won't be executed
- Extended tests will be displayed as Not Selected and won't be executed

Quick [W]:

- If a module has only extended tests, it will be displayed as **Not Selected**
- Extended tests will be displayed as **Not Selected** and won't be executed

Full (Unattended) [E]:

- If a module has only attended tests, it will be displayed as **Not Selected**
- Attended tests will be displayed as **Not Selected** and won't be executed

Full [R]:

• All tests will be selected.

\$	LENOVO	Diagnostics UE	FI		94% Time 08:53 - Version XX.	XX.XXX
	Diagnostic	Status	Progress		Summary	
		t			MOTHERBOARD	1
	FINGERPRIN	t N/A	>	Started at:	2023/11/13 08:52:43	
	KEYBOARD	CANCELED	100% >	Chipset Test:	CANCELED	
	MOUSE	CANCELED	100% >	Finished at:	2023/11/13 08:52:43	
	OPTICAL	NZA	>			
	SENSOR	CANCELED	1007 >	UMBOOG	RESULT CODE 10000000000000-9.17856	
	TOUCH	NZA	>			
	WIRED ETH	NZA	>		MOTHERBOARD	
	CPU	CANCELED	100% >	Stantod at .	2022/11/12 09-52-44	
	Fan	CANCELED	100% >	PCI/PCIe Test:	CANCELED	
	MEMORY	CANCELED	100% >	RTC Test:	CANCELED	
	MOTHERBOAR	D CANCELED	100% >	USB Test:	CANCELED	- 6
	RAID	NZA	>	Finished at:	2023/11/13 08:52:45	- 1
	STORAGE	CANCELED	100% >		RESULT CODE	- 1
		ţ		UMBOOG	0000000000000-9J7W5G	Ţ
	lotal estim	ated time: 00:00):20 of 00:2	2:55	FINAL RESULT CODE	
					U14NCSW42-LJ61T2	
	Passed: 01 Not Applica	Failed: O ble/Available: O	10 Wai)7 Cai	rning: 00 nceled/Not Selected: 0	9 📷	
N	avigation [Arrows] PgU	lp (F9)	PgDn [F10]	View Log [V] Home [E	sc]

Figure 89: Run All diagnostics execution

4	LENOVO	Diagnostics UE	FI		947	Time 08:53 -	Version XX.XX.XXX
	Diagnostic	Status	Progress		Sum	nary	
		t			MOTHER	RBOARD	1
	FINGERPRIN	t N/A	>	Started at:		2023/11/13	A8:52:43
	KEYBOARD	CANCELED	1007 >	Chipset Test:		CANCELED	00.32.13
	MOUSE	CANCELED	100% >	Finished at:		2023/11/13	08:52:43
	OPTICAL	NZA	>		DEOLIT 7	CODE	
	SENSOR	CANCELED	100% >	LIM	RESULI R0000000000	000000-9.17056	
	TOUCH	NZA	>				-
	WIRED ETH	NZA	>		MOTHER	RBOARD	
	CPU	CANCELED	100% >	Stantod at .		2022/11/12	09.52.44
	Fan	CANCELED	100% >	PCI/PCIe Test:		CANCELED	00:32:44
	MEMORY	CANCELED	100% >	RTC Test:		CANCELED	
	MOTHERBOAR	D CANCELED	100% >	USB Test:		CANCELED	40 F0 IF
	RAID	NZA	>	Finished at:		2023/11/13	08:52:45
	STORAGE	CANCELED	1007 >		RESULT	CODE	
		ţ		UM	B0000000000	000000-9J7W5G	1
	Total estim	ated time: 00:00):20 of 00:2	2:55	FI	NAL RESULT CO	DE
					U	ANCSW42-LJ61	12
	Passed: 01 Not Applica	<mark>Failed: 0</mark> ble/Available: 0	10 Wan 17 Can	rning: 00 nceled/Not Selected	1: 09		
N	avigation [Arrows] PgU	p [F9]	PgDn [F10]	Vi	ew Log [V]	Home [Esc]

Figure 90: Run All diagnostics execution

LENOVO	Diagnos	tics UEFI		-== 100%	∎ Time 06:43 - Ver	sion 04.34.000
			RUN	ALL		
			DIAGNOSTICS	EXECUTION		
	Ex St He Te Fi RE	ecution Number: arted at: alth Test: mperature Test: nished at: SULT CODE:	3	2023/11/24 06: PASSED PASSED 2023/11/24 06: UBA0000000900	44 : 10 44 : 11 1000000 - UJBWKI	T
	Ex St He Te Fi RE	ecution Number: arted at: alth Test: mperature Test: nished at: SULT CODE:	4	2023/11/24 06: PASSED 2023/11/24 06: UBA0000000900	44:11 44:12 000000-UJBWKI	
D	ISPLAY					
	Ex St	ecution Number: arted at:	1	0000700700 00·	AA • AA	Ţ
					Stop Tests	6 [Esc]
Total esti	mated time	e: 00:00:05 of 0	1:58:56			
Navigation	[Arrows]			PgUp [F9]	PgDn [F10]	Home [Esc]

Figure 91: Run All diagnostics execution - multiple iterations

The Run All Diagnostics Execution screen provides information about the diagnostics progress of all modules, as well as information about the results. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostics Modules list
- Diagnostic Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

All diagnostic modules will be displayed on Diagnostic Modules List. The ones that are not selected or not applicable for the target system will be grayed with N/A status. Use upper or bottom arrows to scroll modules list.

The screen has one main section that provides information about the diagnostic, as well as a progress bar and a View Log button, both placed at the bottom of the

section, where the former indicates the global execution progress and the latter allows to visualize tests details after finishing the diagnostic execution. That section contains the following diagnostics information:

- Final Result Code (an encrypted code that informs which modules were tested).
- Number of the executed iteration.
- Date and time that diagnostic has started.
- Test (name of the test being currently run).
- Progress of the current test (current test's progress in percentage).
- Total estimated time of the current suite of diagnostic tests.
- A list with all the algorithms which compose device test and their respective status:
 - Waiting, indicating the test is waiting to be run.
 - **Progress** (plus the test execution percentage), indicating the test is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - **CANCELED**, indicating the algorithm has been canceled by user.
 - NOT APPLICABLE/AVAILABLE, indicating the algorithm is not supported by device.
- Date and time that the tests are finished (displayed after test is finished).
- Result Code for test.
- Elapsed time, that is a duration of test in hours, minutes and seconds (displayed after test is finished).

While the diagnostic is running, the user can stop it at any time by pressing the ESC key. If the user does that, the diagnostic is aborted and the status of the test that is being run is changed to CANCELED. After the diagnostic is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the test log (by pressing the V key).

A total sum of **Passed** (Warning tests are also counted as passed as it does not indicates a hardware failure, it just indicates a point of attention), Failed, Not Applicable/Available and Canceled / Not Selected tests are displayed in the Footer Bar.

22 Diagnostics result log

After a test or a recover operation is finished, the user can see the Diagnostics Result Log screen by pressing the V key. That screen is shown in the following figure.

4	LENOVO	Diagnostic	s UEFI	-8= 🛙	00× Time 00:00 -	Version XX.XX.XXX
			RUN	ALL		
			DIAGNOSTICS	RESULT LOG		
	Serial Nu	mber:	INVALID			Ť
	BIOS Vers	ion:	SOCKTO10			
	Machine M	odel:	Lenovo F	roduct		
	Final Res	ult Code:	U1GGV4L	MA-321EMF		
	DISPLAY D	IAGNOSTIC 2	2023/01/27 14:19:19			- 1
	UDI:		W1642 -	GSM		
	Display Na	ame:	W1642 -	GSM		
	Manufactu	rer ID:	GSM			
	Model Nam	e:	W1642			
	EDID Vers	ion:	1.3			L
			Save L	og [F2]		
	Navigatior	(Arrows)	Enter [Space]	PgUp [F9]	PgDn [F10]	Home [Esc]

Figure 92: Run All diagnostics result log

The Diagnostics Result Log screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Diagnostic Log Section
- Save Log Button
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

Additionally, the screen has one main section that shows the diagnostic log, and a Save Log button that allows the user to store the log into an USB-Storage.

If the log content has many rows, user can scroll by pressing the Page Up and Page Down to move the displayed region up and down, respectively. The user can also go back to the Home screen by pressing the ESC key and save the log by pressing the F2 key.

23 Log saving

If the user chooses to save the log by pressing the Save Log button on the Diagnostics Result Log screen, and there are more than one valid device where the log can be saved, the Log Saving screen is displayed, as shown in the figure below.



It is possible to save logs in the Local Storage but only on FAT partitions.

R	LENOVO	Diagnostics	5 UEFI			- - - 100×	Time 00:00	- Version XX	.xx.xxx
				log sav:	ENG				
				STORAGE SEL	ECTION				
		USB:	{] USB DRIVE				(i)		
			J Local Stor J Local Stor J NOVO VOLUI J VERSAOTOT	rage Partition ME ES			(i) (i) (i)		
				Confirm	[C]				
N	av igat ion	[Arrows] Em	ter [Space]			Selected]	tem Info	[I] Back	[Esc]

Figure 93: Storage selection - USB log saving

The Log Saving screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- USB-Storage Selection List

- "Confirm" Button
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

In addition, user can choose a device from the USB or Local FAT Storage Selection List to save the log in. The user can check more information about each Storage partition in the respective "(i)" button.

k	LENOVO	Diagno	stics UEFI		-B	100× Time 00:00	9 - Version	xx.xx.xxx
				LOG SAU	ING			
				STORAGE SE	LECTION			
		ι	SB: [X] USB DRIVE			ω		
				log sal	ING			
		Devic Part: Part: Part:	e Type: USB tion Name: USB DRI tion Size: 15461 M tion Type: FAT	ive 18				
				Ok				
				Confirm	[C]			
N	lavigation [Arrows]	Enter [Space]		Sele	ected Item Info	III Bac	k [Esc]

Figure 94: USB information

ł	LENOVO	Diagnostics UEFI			 1 00×	Time 00:00	– Ver	rsion XX.XX.XXX
			LOG	SAUING				
			STORAGE	SELECTION				
		USB: []]USI	B DRIVE			ω		
			LOG	SAVING				
		Device Type: NU Partition Name: Partition Size: Partition Type:	Me : Local Storage Pa : 1044 MB : FAT	rtition				
				Ok				
			Cont	firm (C)				
N	avigation [A	rrows] Enter [S	pacel		Selected	Item Info	ш	Back [Esc]

Figure 95: Local storage information

After the user chooses a device, s/he can press "Confirm". The application will attempt to save the log into the selected device.

If the saving operation is successful, a window will be displayed to inform the user that the operation was successful (as shown in the next figure). If the operation does not work, a window will be displayed to inform the user that the operation was not successful. In both cases, the user must press ENTER, and the Diagnostics Result Log screen will be displayed again.

LENOVO Diagnostics	s UEFI	27/.	Time 12:23 - Vers	ion XXX.XXX.XXXX		
	CPU -	QUICK				
	DIAGNOSTICS	RESULT LOG				
Serial Number:	PF3C97DP			1		
BIOS Version:	R1RET 18W	R1RET18W (T06) (0.18)				
Machine Model:	ThinkPad	14 Pro]			
Final Result	LOG S	AVING				
CPU QUICK D Diagnosti data, do UDI:	c results may contain sen you wish to continue?	sitive or device i	dentification			
Display Nam	Cancel [Esc]	Ok				
Model:	12th Gen	Intel (R) Core (TM)	i5-1240P			
Vendor :	INTEL					
Number of Cores:	12			1		
	Save Lo	yg (F2)				
Navigation [Arrows]	Enter [Space]	PgUp [F9]	PgDn (F10)	Home [Esc]		

Figure 96: Sensitive information confirmation pop-up



Figure 97: Log saving information pop-up

UEFI application must always allow user to save and search files on following volumes:

- Hdd FAT16 or FAT32 partition;
- USB Memory Stick.

In case the user tries to save the log to an unsupported file system, a popup will be displayed to indicate that the media is in an invalid format. The popup can be seen below:

6	LENOVO	iagnostics	UEFI		2	277. I Time	12:23	Versi	on XXX.X	0000
				CPU -	QUICK					
				DIAGNOSTICS	RESULT LOG					
	Serial Numbe	r:		PF3C97DP						1
	BIOS Version	:		R1RET 18W	(106) (0.18)					
	Machine Mode	1:		ThinkPad	14 Pro					
	Final Result			LOG	SAVING					- 84
	CPU QUICK D There is no device formatted in FAT32 to save the log. Please change the device to a correct format or plug a new device and try again.					у		ł		
	Display Nam			C	lk					
	Model:			12th Gen	Intel(R) Core	(THD i5-12	40P			
	Vendor :			INTEL						
	Number of Co	res:		12						1
			l l	Save L	og (F2)					
	Navigation [trrows]	Enter	[Space]	PgUp (F9)	P	gDn (F16	9]	Hone	[Esc]

Figure 98: Format notice pop-up



When the user chooses to export logs, two logs are going to be saved: one with a ".log" extension and a ".json" file.

If the user has a config.ini file on device root, with LOG_AUTO_SAVE parameter enabled, the application will perform the saving of json logs automatically. While saving logs, and sfter saving them, user is going to be met with a pop up informing that the logs are being saved, and after the process is complete, another one, informing the process is finished.

ł	LENOUO Diagnostics UEFI 412.º Time 21:10 - Versi	on XXXXXXX no						
	STORAGE - QUICK							
	DIAGNOSTICS EXECUTION							
		1						
	LOG SAVING							
	Log files successfully saved.	- 1						
	STORAGE: UD PC SN740 SDDQNQD-1T00-1201 Serial Number: 22425Q440403 8S Code: 8SSSS1D336930Q002AL003U							
	Started at: 2023/06/26 21:10:24 Benice Read Test: CONCELED	1						
	View Log	[V]						
1	Total estimated time: 00:00:01 of 00:03:45							
N	avigation [Arrows] PgUp (F9) PgDn (F10)	Home [Esc]						

Figure 99: Log saving success pop-up

23.1 Execution type

On the logs generated by the tests that the user can perform on UEFI diagnostics, a field named "EXECUTION TYPE", in which the description of what test flow was executed will be registered (i.e., BATTERY QUICK, AUDIO QUICK, etc...), will be available to the users, to help to better identify what was actually tested in each log.

```
{
 "start_time": "20231031T111436",
 "finish_time": "20231031T113635",
 "start_time_epoch": "1698750876",
 "finish time epoch": "1698752195",
 "application version": "Lenovo Diagnostics UEFI Bootable 04.34.000",
 "execution_type": "AUTOMATED EXECUTION",
 "generic_mode": false,
 "machine model": "ThinkPad P15v Gen 3",
 "model_name_is_valid": "yes",
 "machine_uuid": "{65A412CC-30A6-11B2-A85C-B47B67E7E15F}",
 "machine_serial_number": "PF3SFFFB",
 "serial_number_is_valid": "yes",
 "machine_type_model": "JP5A5SIT18",
 "machine_type_model_is_valid": "yes"
 "bios_version": "N3KET16E (0.01.STT )",
 "wired ethernet mac address 1": "6C-24-08-30-E3-73",
 "iterations": [
   {
```

Figure 100: Execution Type field, on a JSON log

```
SERIAL_NUMBER: PF3SFFFB
BIOS_VERSION: N3KET16E (0.01.STT )
MACHINE_MODEL: ThinkPad P15v Gen 3
APPLICATION_VERSION: Lenovo Diagnostics UEFI Bootable 04.34.000
EXECUTION_TYPE: AUTOMATED EXECUTION
```

BEGIN_EXECUTION

```
+++ 20231031T111436UTC BATTERY QUICK DIAGNOSTIC 1698750876
UDI: Celxpert
DISPLAYNAME: 651-Celxpert
```

Figure 101: Execution Type field, on a txt log

23.2 Execution summary

On TXT logs, at the end of the file, a summary that contemplates an overview of the test flow results is going to be available, to help users to visualize how it went.

+++ TEST SUMMARY

STORAGE :	CANCELED
TOTAL TESTS:	6
PASSED TESTS:	0
FAILED TESTS:	0
CANCELED TESTS:	: 6
NOT APPLICABLE	TESTS: 0

ELAPSED TIME: 00:00:03 FINAL_RESULT_CODE: U19CTHRZJ-TXPSX3

--- TEST SUMMARY

Figure 102: Results Summary

On this summary, users are met with:

- The modules that were tested, and what their general status was (PASSED, FAILED, WARNING, CANCELED or NOT APPLICABLE).
- The total number of executed tests, and how many tests were finished with each status (PASSED, FAILED, WARNING, CANCELED or NOT APPLICABLE).
- The execution's elapsed time.
- The final result code.

24 System information

The System Information screen with the System tab selected is shown in the following figure.

\$	LENOVO	Diagnostics	UEFI	-8=	<mark>347.</mark> •	Time 14:	52 - Vers	ion XX.X	x.xxx
			SYSTEM IN	FORMATION					
	choose a	MODULE :							
	SYSTEM (0]	MACHINE INFORMATION	l					1
	BATTERY	[1]							
Ì	CPIL [2]		Machine Manufacture	er: L	.Enovo				
			Machine Type-Model ((MTM): J	E440SIT	22			
	DISPLAY	[3]	Product Version:	T	'hinkPad	14 Pro			
	Fan [4]		Serial Number:	Р	F3C97DF	1			
	KEYBOARD [5]								
	MEMORY [6]	BIOS INFORMATION	BIOS INFORMATION					
	MOTHERBO	ARD [7]	BIOS Version:	R	1RET 18W	(TO6) (0.	18)		
	Mouse (8]	BIOS Release Date:	1	1/10/20	21			
	STORAGE	[9]	BIOS Manufacturer:	L	.ENOVO				
			EC Version:	R	1RHT 18W	(0.18)			
			Intel ME Version:	1	6.0.10.	1473			Ţ
					Е	xport Sy	stem Info	rmation	[F2]
	Navigation	n [Arrows]	Enter [Space]	PgUp (F	9]	PgDn	[F10]	Home (Escl

Figure 103: System information - system tab



The value of field "Eth Physical Address" can be highlighted in red when it is considered invalid. Will be considered invalid the MAC addresses that have all the same characters or be present in the MAC address list below. Invalid MAC address list:

- "88-88-88-88-87-88"
- "88-88-88-88-87"

Example in the figure below:

LENOVO Diagnostics UEF:	I	- 100× Tim	e 00:00 - Vers	sion XX.XX.XXX
	SYSTEM INFORMAT	ION		
CHOOSE A MODULE:				
SYSTEM [0]	MACHINE INFORMATION			T
CPU [1]				
DISPLAY [2]	Machine manufacturer:	LEN0V0		
KEVROARD [3]	Machine Type-Model(MTM):	INVALID		
	Product version:	Lenovo Product		
MEMURY [4]	Serial number:	INVALID		
MOTHERBOARD [5]	Eth Physical Address:	88-88-88-88-88-88-8	18	
MOUSE [6]	BIOS INFORMATION			
STORAGE [8]	DIGS IN COMPLEX			_
тоисн (9)	BIOS Version:	M2RKT11R		
	BIOS release date:	11/28/2019		
[1/2]	BIOS manufacturer:	LEN0V0		
		_		
More [M]		Export	System Inform	mation [F2]
Navigation [Arrows]	Enter [Space] Pg	քՍթ (F9) Բ9	gDn [F10]	Home [Esc]

Figure 104: System information - system tab

The System Information screen with the Battery tab selected is shown in the following figure.

7	LENOVO	Diagnostics	5 UEFI		-	= <mark>35%</mark> •	Time 1	14:52 - Ver	sion XX.X	X.XXX
				SYSTEM IN	FORMATION					
	choose a	MODULE :								
	SYSTEM (0]		BATTERY INFORMATION	l					Ť
	BATTERY	[1]								
	CPU [2]			UDI:		Sunwoda				
	DTODIAU	[2]	-1	Display Name:		221-Sum	Joda			
	DISPLHY	131	-1							
	Fan [4]			Primary:		YES				
	KEYBOARD	[5]		Manufacturer:		Sunwoda				
	MEMORY [61		Serial Number:		221				- 84
			-	Bar Code Number:		W1SZ19W0	OODD			
	MUTHERBU	ARD [7]	-1	FRU Number:		5B11E339	5			
	MOUSE [8	1		Firmware Level:		4 8				
	STORAGE	[9]		Manufacture Date:		2021/09/	/19			
				First Use Date:		2021/12/	/01			
				Temmerature:		43 C				t
						E	Export	System Info	ormation	[F2]
	Navigation	n [Arrows]		Enter [Space]	PgUp	[F9]	Pgl	Dn [F10]	Home	[Esc]

Figure 105: System information - battery tab

The System Information screen with the CPU tab selected is shown in the following figure.

•	LENOVO	Diagnostics	UEFI	-	<mark>e 35%</mark>	Time 14:52	2 - Vers	ion XX.X	X.XXX	
			SYSTEM	INFORMATION						
	choose a	MODULE :								
	SYSTEM (0]	CPU INFORMATION						T	
	BATTERY	[1]								
Ì	CPIL [2]		UDI:		12th Ge	en Intel(R)	Core (TM)		
					i5-1240	0P - INTEL				
	DISPLAY	[3]	Display Name:		12th Ge	en Intel(R)	Core (TM)		
	Fan [4]				i5-1240	0P - INTEL				
	KEYBOARD [5]									
	MEMORY (6]	Model:	Model:		12th Gen Intel(R) Core(TM) i5-1240P				
j	MOTHERBO	ARD [7]								
		-	Vendor :		INTEL					
	MOUSE [8]	Number of Cores	:	12					
	STORAGE	[9]	Number of Enable	ed Cores:	12					
			Number of Thread	ls:	16					
			Simature:		906a2				Ţ	
						Export Syste	em Info	rmation	[F2]	
	Navigation	n [Arrows]	Enter [Space]	PgUp	[F9]	PgDn (F	10]	Home	[Esc]	

Figure 106: System information - CPU tab

The System Information screen with the Display tab selected is shown in the following figure.

LENOVO	Diagnostics UEF	I	-== 517. Iime 17:46 - Version XX.XX.XXX
		SYSTEM INFORMAT	ION
CHOOSE A	MODULE :		
SYSTEM (:0]	DISPLAY INFORMATION	1
BATTERY	[1]		
CPU [2]		UDI:	BOE CQ NV140DRM-N62 - BOE
DTODU AU	101	Display Name:	BOE CQ NV140DRM-N62 - BOE
DISPLHY	[3]		
FAN [4]		Manufacturer ID:	BOE
KEYBOARD	[5]	Model Name:	BOE CQ NU140DRM-N62
MEMORY (61	EDID Version:	1.4
MOTUEDDO	ADD [7]	Max Resolution:	2240 x 1400 pixels
HUIHLKBU	HKV LTJ	Max Image Size:	30 cm x 19 cm
MOUSE E8	1	Input Type:	Digital
STORAGE	[9]	Display Type:	RGB 4:4:4
			Export System Information [F2]
Navigatio	n [Arrows]	Enter [Space]	Home [Esc]

Figure 107: System information - display tab

The System Information screen with the Fan tab selected is shown in the following figure.

ł	LENOVO	Diagnostics UEFI	[-
			SYSTEM INF	ORMATION
	choose a	MODULE :		
	SYSTEM [0]		FAN INFORMATION	
	BATTERY	[1]		
	CPU [2]		UDI:	FAN_SYSTEM
	DISPLAY	[3]	Display Name:	FAN_SYSTEM
	FAN [4]		Number of Fans:	2
	KEYBOARD	(5)		
	MEMORY (61	Fan 1 Speed:	3900 RPM
	MOTHERBO	ARD [7]	Fan 2 Speed:	3900 RPM
	MOUSE [8	1	CPU Temperature:	54 L
	STORAGE	[9]		
				Export System Information [F2]
	Navigatio	n [Arrows]	Enter [Space]	Home [Esc]

Figure 108: System information - fan tab

The System Information screen with the Keyboard tab selected is shown in the following figure.

LENOVO	Diagnostics UEF	ľ	- 51% Time 17:46 - Version XX.XX.)	κxx
		SYSTEM INFORMAT	CON	
CHOOSE A	MODULE :			
SYSTEM (0]	KEYBOARD INFORMATION		
BATTERY	[1]			-0
CPU [2]		UDI :	Keyboard	
νΔΙΦΡΤΠ	[3]	Display Name:	PS/2 Keyboard	
FAN L4J		Device Type:	PS/2 Keyboard	
KEYBOARD	[5]			
MEMORY [6]			
MOTHERBO	ARD [7]			
MOUSE [8	1			
STORAGE	[9]			
			Export System Information [F2]	
Navigation	n [Arrows]	Enter [Space]	Home EEs	cl

Figure 109: System information - keyboard tab

The System Information screen with the Memory tab selected is shown in the following figure.

\$	LENOVO	Diagnostics UE	FI	-8	= <mark>35%</mark> •	Time	14:52	- Vers	ion XX.X	XXXXX
			SYSTEM INFORM	IATION						
	choose a	MODULE :								
	SYSTEM [0]		MEMORY INFORMATION					1		
	BATTERY [1]									
ĺ	CPU [2]		UDI:		MEMORY_UDI					
		101	Display Name:		MAIN_MEMORY					
	DISLIHI	101								
	FAN [4]		Total Physical Memory:		16384 MB					
	KEYBOARD [5]									
	MEMORY [6] Motherboard [7]		Origin: SMBIOS Type: LPDDR5 Manufacturer: SK Hynix		SMBIOS LPDDR5					ł
	MOUSE [8]	Maximum Speed: 6400 MT/s							
	STORAGE	[9]	Current Speed:		4000 MT.	/s				
			Size:		2048 MB					
			Bank Locator:		RANK 0					t
					ł	Export	Syster	ı Info	rmation	[F2]
	Navigatio	n [Arrows]	Enter [Space]	PgUp [F91	Pg	Dn [F1	0]	Home	[Esc]

Figure 110: System information - memory tab

The System Information screen with the Motherboard tab selected is shown in the following figure.

Ş	LENOVO	Diagnostics	UEFI		-	= <mark>35%</mark> 	Time 14:52	- Vers	ion XX.>	xx.xxx
				SYSTEM IN	FORMATION					
	CHOOSE A MODULE:									
	SYSTEM [0]			MOTHERBOARD INFORMATION						1
	BATTERY [1]									
	CPU [2]			UDI: Display Name:		MOTHERBOARD_UDI Main_Motherboard			1	
			-1							
			-1							
	FAN [4]		_	No. USB Host Controllers:		2				
	KEYBOARD [5]			Number of PCI:		24				
	MEMORY [6] Motherboard [7] Mouse [8]			RTC Presence: 8S Code: Resource:		Yes				
						8SJE440HY10XL1HF1AY0012			I	
						PCI resource				
	STORAGE	[9]		Index:		1				
			_	Slot:		0				
			Class:		Bridge	Deuice			Ţ	
							Export Syste	m Info	rmation	[F2]
	Navigatio	n [Arrows]		Enter [Space]	PgUp	[F9]	PgDn [F1	.0]	Home	[Esc]

Figure 111: System information - motherboard tab

The System Information screen with the Mouse tab selected is shown in the following figure.

\$	LENOVO	Diagnostic	s UEFI	- - = <mark>357.</mark> •	Time 14:52 - Ver	sion XX.XX.XXX	
			SYSTEM	INFORMATION			
	choose a	MODULE :					
	SYSTEM [0]		MOUSE INFORMATION			1	
	BATTERY [1]						
j	CPU [2]		UDI:	PS/2 Mo	use		
			Display Name:	PS/2 Mo	use		
	DISPLAY [3]						
	FAN [4]		Device Type:	PS/2 Mo	use		
	KEYBOARD [5]		Resolution X:	4			
j	MEMORY [6]		Resolution Y:	4			
	MOTHERBOARD [7]		Has Left Button:	Has Left Button: YES			
			Has Right Button:	YES			
	MOUSE [8]]					
	STORAGE	[9]	UDI:	I2C Mou	se		
			Display Name:	I2C Mou	se		
			Vendor Identifier	: 0x27Сб		1	
					Export System Info	rmation [F2]	
	Navigation	n [Arrows]	Enter [Space]	PgUp (F9)	PgDn [F10]	Home [Esc]	

Figure 112: System information - mouse tab

The System Information screen with the Optical tab selected is shown in the following figure.

LENOVO	Diagnostics UEF	I	- 100% Time 00:00 - Version XX.XX.XXX			
		SYSTEM INFO	DRMATION			
CHOOSE A	MODULE:					
SYSTEM [0]	OPTICAL INFORMATION				
CPU [1]						
DISPLAY	[2]	UDI:	HL-DT-ST-DVDROM DH60N-K7NGCT90819			
VEVROARD	[9]	Display Name:	DVDROM DH6ON-HL-DT-ST			
KETDUHKU	[3]					
MEMORY (4]	Model number:	DVDROM DH60N			
MOTHERBOARD [5] OPTICAL [6] RAID [8]		Manufacturer:	HL-DT-ST			
		Serial number:	K7NGCT90819			
		Firmware revision:	1.02			
STORACE	[9]	Size:	0 MB			
STURAGE [9]		Sector size:	0 bytes			
		supported features:	DVD-ROM, CD-ROM.			
			Export System Information [F2]			
Navigation	n (Arrows)	Enter [Space]	Home [Esc]			

Figure 113: System information - optical tab

The System Information screen with the RAID tab selected is shown in the following figures.

• Physical RAID:

	LEN0V0	Diagnostics	s UEFI	-== 100×	Time 00:00 - Ve	rsion XX.XX.XXX	
b			SYSTEM	INFORMATION			
	CHOOSE A	MODULE:					
	SYSTEM [0]		RAID INFORMATION			1	
	CPU [1]						
j	DISPLAY [2]		UDI:	RAID	RAID RAID		
ł			Display Name:	RAID			
	MEMORY [3]		_				
	MOTHERBOARD [4]		Resource:	Raid Device			
	RAID [6]		Bus:	0x0			
i	WIRED ETHERNET [7]		Device:	0×17			
1			Function:	0×0			
			Vendor Id:	0×8086			
						Ţ	
				Export	: System Inform	mation [F2]	
	Navigation	n [Arrows]	Enter [Space]	PgUp [F9]	PgDn [F10]	Home [Esc]	

Figure 114: System information - physical RAID tab

• Virtual RAID:
	LENOVO	Diagnostics UEF	I	- = 100%	Time 00:00 -	Version XX.XX.XXX
3			SYSTEM INFORM	ATION		
	CHOOSE A	MODULE:				
	SYSTEM [0]	Function:	0x0		T
	CPU [1]		Vendor Id:	0x8086		
	DISPLAY	[2]	Is Logical device:	YES		
	MEMORY [3]				
	MOTHERBO	ARD [4]	Volume information:	1 volume(s) cor	figured	
	RAID [6]		Volume Type:	0		
j	WIRED ET	HERNET [7]	Raid Level:	0		
			Product ID:	RAID 0 Volume		
			Volume Name:	Volume0		
			Size:	10 GB		
				Export	t System Info	• ormation [F2]
	N	[0]	Fatan (Pasa)	D-11- (150)	D-D- (E10)	Hanse (Free)
	Nav Igation	I [HITOWS]	Enter ISpacel	rgup trai	rgon (r10)	Home LLSCJ

Figure 115: System information - virtual RAID tab

The System Information screen with the Storage tab selected is shown in the following figure.

रे	LENOVO	Diagnostics U	EFI	-	= <mark>35%</mark> •	Time 14:52 - Vers	ion XX.XX.XXX		
			SYSTEM IN	FORMATION					
	choose a	MODULE :							
	SYSTEM (0]	STORAGE INFORMATION				Ť		
	BATTERY [1] CPU [2] DISPLAY [3] FAN [4] KEYBOARD [5]								
			UDI :		Ramaxel Technology (Shenzhen)				
					limited	company-UMIS			
					RPJTJ256	5MGE1QDQ-SS0L25209	X1RC19G1		
					0B2				
			Display Name:		UMIS RPJTJ256MGE1QDQ-Ramaxe1				
	MEMORY [6]			Technology (Shenzhen) limited company				
	MOTHERBO	ARD [7]	1						
	MOUSE [8]	Model Number:		UMIS RP.	JT J256MGE1QDQ			
	STORAGE	[9]	Manufacturer:		Ramaxe l	Technology (Shenz	:hen)		
					limited	company			
			Device Time:		NUMe		Ţ		
					E	Export System Info	rmation [F2]		
	Navigation	n [Arrows]	Enter [Space]	PgUp	(F9)	PgDn [F10]	Home [Esc]		

Figure 116: System information - storage tab

The System Information screen with the Touch tab selected is shown in the following figure.

ł	LENOVO	Diagnostics	UEFI	t			Time 09:19 - Vers	sion XX.XX.XXX
				SYSTEM IN	FORMATION			
	CHOOSE A	MODULE:						
	SYSTEM [C)]		TOUCH INFORMATION				Ť
	CPU [1]							
j	DISPLAY	[2]		UDI:		Melfas-L	GDisplay Incell T	ouch
	MEMORY [3	3]		Display Name:		Melfas-L	GDisplay Incell 1	ouch
	MOTHERBOA	ARD [4]		Absolute Min X:		0		
ĺ	STORAGE [5]			Absolute Min Y: Absolute Min Z: Absolute Max X:		0 0 4095		
j	TOUCH [6]	тоисн (6)						
	WIRED EIF	HERNEI [/]		Absolute Max Y:		4095 0 N0		
				Absolute Max Z:				
				Sup. Alternative Bu	utton:			
				Supports Pressure a	as Z:	YES		
			Manufacturer:		Melfas		Ļ	
						E	xport System Info	rmation [F2]
	Navigation	[Arrows]		Enter [Space]	PgUp	[F9]	PgDn [F10]	Home [Esc]

Figure 117: System information - touch tab

The System Information screen with the WiFi tab selected is shown in the following figure.

LENOVO	Diagnostics	UEFI	-
		SYSTEM IN	FORMATION
CHOOSE A	MODULE :	_	
WIFI [0]		WIFI INFORMATION	
		UDI:	Wifi Adapter
		Display Name:	Wifi Adapter
		MAC Address:	7C-2A-31-5B-B3-3C
		Broadcast Address:	FF-FF-FF-FF-FF
	[2/3	21	
-			
Back []	8]		Export System Information [F2]
Navigation	(Arrows)	Enter [Space]	Home [Esc]

Figure 118: System information - WiFi tab

The System Information screen with the Wired Ethernet tab selected is shown in the following figure.

\$	LENOVO	Diagnostic	cs UEFI	- = 1002	Time 00:00 - Ve	rsion XX.XX.XXX		
			SYSTEM I	NFORMATION				
	CHOOSE A	MODULE :						
	SYSTEM (0) CPU (1)					T		
			MAC Address:	60-32-B1-5	D-67-FC			
i	DISPLAY	[2]	Media State:	Media prese	Media present			
	WTWOTH A		Policy:	DHCP	DHCP			
	Memory (3) Motherboard (4) Storage (6)		IPv4:	192.168.15	192.168.15.9			
			Subnet Mask:	255.255.25	255.255.255.0			
			Default Gateway:	192.168.15	192-168-15-1			
i	WIRED ET	HERNET [7]	DNS Server 1:	192.168.15.1				
			PCI Bus:	0×00				
			PCI Device:	0x00	0x00			
			PCI Function:	0×04				
				_		1		
					Export System Info	ormation [F2]		
	Navigatior	(Arrows)	Enter [Space]	PgUp [F9]	PgDn [F10]	Home [Esc]		

Figure 119: System information - wired ethernet tab

The System Information screen is displayed after the user enters the option System Information on the Home screen. The System Information screen provides detailed information about the machine, the memory devices, and the storage devices. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Modules Tabs Bar;
- Content Tab;
- Export System Information Button;
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title Bar helps the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

Modules Tabs Bar contains the modules options to load information and displays the tab currently selected (the name of current tab has a red background to differentiate it from the other tabs), while the Content Tab is the region that exhibits information corresponding to the selected tab. Export System Information Button can be accessed between the Content Tab and the Instruction Footer Bar, where it is possible to export all the modules' information at once to an USB-Storage device.

*	LENOVO	Diagnostics	UEFI	54%	Time 16:59 - Ver	sion XXXXXXXX
			SYSTEM IN	FORMATION		
	CHOOSE A	MODULE :				
l	SYSTEM (0)		MACHINE INFORMATION			1
	BATTERY [1]					
ľ	CPU [2]		Machine Manufacture	r: LENOVO		
ľ	DISPLAY	(3)	SYSTEM INFORMAT	TION EXPORTING		
ľ	FAN [4]					
KEVECARD F System information file exported may contain sensitive or d					ve or device	
I	Memory (6]		o continue.		
l	MOTHERBO	ARI (Cancel [Esc]	Ok		
l	MOUSE [8	1	BIOS Release Date:	11/10/20	021	
	STORAGE	[9]	BIOS Manufacturer:	LENOVO		
ľ			EC Version:	R1RHT184	(0.18)	
			Intel ME Version:	16.0.10	. 1473	1
				1	Export System Info	ormation [F2]
	Navigatio	n [Arrows]	Enter [Space]	PgUp (F9)	PgDn (F10)	Home [Esc]

Figure 120: Sensitive information pop-up

The user can change the current tab either by using mouse/touch device (Bootable version only) or by using the up (\land) and down (\checkmark) keys to navigate among the options and by pressing ENTER to access the option. The Content Tab region will display information about the device on the selected tab. The user can also scroll information content using the Page Up and Page Down keys if the number of content rows is greater than the number of rows on the screen.

For the **System tab**, the following information is displayed on the Content Tab:

- Machine Manufacturer;
- Machine Type-Model (MTM);
- Product Version;
- Serial Number;
- BIOS Version;
- BIOS Release Date;
- · BIOS Manufacturer;

- EC Version;
- Intel ME Version;
- Processor Manufacturer;
- Processor Version.

For the **Battery tab**, the following information is displayed on the Content Tab:

- Primary;
- Manufacturer;
- Serial Number;
- Bar Code Number;
- FRU Number;
- Firmware Level;
- Manufacture Date;
- First Use Date;
- Temperature;
- Device Chemistry;
- Cycle Count;
- Charging Status;
- Remaining Charge;
- Capacity Mode;
- Full Charge Capacity;
- Remaining Capacity;
- Design Capacity;
- Current;
- Voltage;
- Design Voltage;
- Warranty Period;
- Warranty Cycles;
- OptionalMFGFunction2.

For the **CPU tab**, the following information is displayed on the Content Tab:

- UDI;
- Display Name;

- Model;
- Vendor;
- Number of Cores;
- Number of Enabled Cores;
- Number of Threads;
- Signature;
- Max Speed;
- Current Speed;
- Features;
- Cache L1;
- Cache L2;
- Cache L3.

For the **Display tab**, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- Manufacturer ID (a three-letter code identifying the manufacturer);
- · Model Name;
- EDID Version;
- Max Resolution (in pixels);
- Max Image Size (in cm);
- Input Type (Analog or Digital);
- Display Type.

For the **Fan tab**, the following information is displayed in the Content Tab:

- UDI;
- Display Name;
- CPU Fan Speed;
- CPU Temperature.

For the **Keyboard tab**, the following information is displayed in the Content Tab:

- UDI;
- Display Name;

- Device Type;
- Serial Number (when applicable);
- Manufacturer (when applicable);
- Product Name (when applicable);

For the **Memory tab**, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- Total Physical Memory (total of physical memory of machine in MB) and, for each memory device installed on machine:
 - Origin (Identification of memory device);
 - Type (DDR2, DDR3, EEPROM and so on);
 - Manufacturer;
 - Maximum Speed (in MT/s);
 - Current Speed (in MT/s);
 - Size (in MB);
 - Part Number;
 - Serial Number.

For the Motherboard tab, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- No. of USB Host Controllers;
- Number of PCI;
- RTC Presence;
- 8S Code (when applicable);
- Thunderbolt FW Version (when applicable);
- Resource:
- Index
- Slot
- Class name:
- Subclass name:

- Resource:
- PCI Index:
- PCI Slot:
- Class name:
- Subclass name:
- Programming Interface;
- PCI Bus:
- PCI Device:
- PCI Func:
- Vendor ID:
- Product ID:
- PCI Spec Version:
- Offboard Device
- Resource:
- Index:
- USB Version:
- Class name:
- Subclass name:
- Vendor ID:
- Product ID:
- Vendor:
- Product:
- PCI Spec Version:
- Offboard Device

For the **Mouse tab**, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- Device Type;
- Resolution X;
- Resolution Y;

- Has Left Button;
- Has Right Button;
- Serial Number (when applicable);
- Manufacturer (when applicable);
- Product Name (when applicable);

For the Optical tab, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- Model Number;
- Manufacturer;
- Serial Number;
- Firmware Revision;
- Size;
- Sector Size;
- Supported Features.

For the **RAID tab**, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- Resource;
- Bus (current item bus hexadecimal id);
- Device (current item device hexadecimal id);
- Function (current item function hexadecimal id);
- Vendor ID (current item vendor hexadecimal id).

For Virtual RAID, the following information is also displayed on the Content Tab:

- Is Logical device;
- Volume information;
- Volume Type;
- Raid Level;
- Product ID;
- Volume Name;

• Size.

For the **Storage tab**, the following information is displayed on the Content Tab:

When the device is eMMC:

- UDI;
- Display Name;
- Model Number;
- Manufacturer;
- Device Type;
- Serial Number;
- · Firmware Revision;
- Size;
- Rotation Rate;
- Physical Block Size;
- Logical Block Size;
- No. of Logical Blocks

When the device is NVMe:

- UDI;
- Display Name;
- Model Number;
- Manufacturer;
- Device Type;
- Serial Number;
- 8S Code; (when applicable)
- Firmware Revision;
- Size;
- Rotation Rate;
- Temperature;
- Physical Block Size;
- Logical Block Size;
- No. of Logical Blocks;

• VMD Active; (when applicable)

When the device is SSD:

- UDI;
- Display Name;
- Model Number;
- Manufacturer;
- Device Type;
- Serial Number;
- Firmware Revision;
- Size;
- Rotation Rate;
- Temperature;
- Physical Block Size;
- Logical Block Size;
- No. of Logical Blocks;
- Supported Standards:
 - ATA/ATAPI 4;
 - ATA/ATAPI 5;
 - ATA/ATAPI 6;
 - ATA/ATAPI 7;
 - ATA8_ACS;
- Standard version;

When the device is SATA HDD:

- RAID; (If RAID is configured, the application will show the device physical location for each device, as well as the RAID physical location where each storage is connected.)
- UDI;
- Display Name;
- Model Number;
- Manufacturer;
- Device Type;

- Serial Number;
- Firmware Revision;
- Size;
- Rotation Rate;
- Temperature;
- Physical Block Size;
- Logical Block Size;
- No. of Logical Blocks;
- Supported Standards:
 - ATA/ATAPI 4;
 - ATA/ATAPI 5;
 - ATA/ATAPI 6;
 - ATA/ATAPI 7;
 - ATA8_ACS;
- Standard version;
- 8S Number; (when applicable)

When the device is UFS:

- UDI;
- Display Name;
- Model Number;
- Manufacturer;
- Device Type;
- Serial Number;
- Firmware Revision;
- Size;
- Rotation Rate;
- Physical Block Size;
- Logical Block Size;
- No. of Logical Blocks.

For the **Touch tab**, the following information is displayed on the Content Tab:

• UDI;

- Display Name;
- Absolute Min X;
- Absolute Min Y;
- Absolute Min Z;
- Absolute Max X;
- Absolute Max Y;
- Absolute Max Z;
- Supports Alternative Button;
- Supports Pressure as Z;
- Serial Number (when applicable);
- Manufacturer (when applicable);
- Product Name (when applicable);

For the **WiFi tab**, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- MAC Address:
- Broadcast Address:

For the **Wired Ethernet tab**, the following information is displayed on the Content Tab:

- UDI;
- Display Name;
- MAC Address:
- Media State;
- Policy;
- IPv4;
- Subnet Mask
- Default Gateway;
- DNS Server 1;
- PCI Bus;
- PCI Device;
- PCI Function;

To exit the System Information screen and go back to the Home screen, the user must press the ESC key.

25 Hardware Diagnostic Events

This tool is only available for ThinkStation environments

Hardware Diagnostic Events are exhibited by accessing the Home screen, Tools, Diagnostic Event Log.

Nevertheless, this tool is currently limited to only ThinkStation products, specifically to P520C, P520, P720, P920, P5, P7 and PX.

When entering the tool, the events are loaded and displayed, as demonstrated in the next image.

LEN0V0	Diagnosti	ics UE	FI		Time 15:42 - Version XX.X	xxxx
			HARDWARE DIAG	NOSTIC EVENTS		
For	more infor	matior	n about each event coc http://www.thinkwor	le, select "code lo kstationsoftware.c	ookup" on this web site: om	
Date	Time	Code		Description	IS	1
2023/11/1	3 15:26:47	N000	Power button pressed			
2023/11/1	3 15:26:46	N000	Power button pressed			
2023/11/1	3 15:26:35	C001	System cover opened			
2023/11/1	3 15:26:14	C001	System cover opened			
2023/11/1	3 15:26:13	C001	System cover opened			
2023/11/1	3 15:26:01	C001	System cover opened			
2023/11/1	3 15:25:56	C001	System cover opened			
2023/11/1	3 15:25:50	C001	System cover opened			
2023/11/1	3 15:25:27	C001	System cover opened			
2023/11/1	3 15:25:26	C001	System cover opened			
2023/11/1	3 15:25:25	C001	System cover opened			
2023/11/1	3 15:25:24	C001	System cover opened			- 1
2023/11/1	3 15:25:13	C001	System cover opened			Ţ
Serial Numb	er: INVALI	D				
Navigation	[Arrows]		Enter [Space]	PgUp [F9]	PgDn [F10] Home	[Esc]

Figure 121: Hardware diagnostic events

The application may be unable to retrieve the requested information. When that occurs, users can use the "Clear Front Panel LED" button to be able again to retrieve hardware diagnostic events.



"Clear Front Panel LED" button is not available to ThinkStation products P5, P7 and PX.

26 Bad block recovery

The Bad Block Recovery is a tool available for HDD and SSD/NVMe devices, that recovers bad blocks in a storage device.

The system allows the user to access that tool by accessing the Home screen, Tools, Bad Block Recovery.



Bad Block Recovery tool relies on UEFI protocols availability in order to be available for the system.

After the user enters the Bad Block Recovery option, the application will display the storage devices available in the system. The menu Device Selection is displayed, as shown in the next figure.

LEN0V0	Diagnostic	s UEF I			- = 100	<mark>0×</mark> ∎ 1	Γime Θ	0:00 - U	Jersion XX	.xx.xxx
			BAD BLOCK	RECOVER	Y					
			DEVICE S	ELECTION						
	[X]	Select / De	eselect All Op	otions						
	[X]	UMIS RPITJ2	256PED2MWX-Phi	ison Elec	tronics C	Corp.		(I)		
				503						
			Confi	rm [C]	_					
Navigatio	n [Arrows]	Enter	[Space]	s	elected	l ten	Info	[1]	Home	[Esc]

Figure 122: Bad block recovery device selection

This screen also allows seeing devices details. To access this feature, the user has to press the I key when the desired device is focused, leading to the exhibition of a popup with the device information, as shown in the subsequent figure.

LEN0V0	Diagnostic	s UEF I	- 100× Time 00:00 - U	Jersion XX.XX.XXX					
		BAD BLOC	K RECOVERY						
	DEVICE SELECTION								
	[X]	Select / Deselect All 0	ptions						
		STORAGE	NFORMATION						
	Display N Manufactu Device Ty Serial Nu Size:	lame: UHIS RPITJ256PED2M wrer: Phison Electronics pe: NVMe mber: SS0T78003z1CD91J10 238 GB	WX-Phison Electronics Corp. Corp. 35						
			Dk						
Confirm [C]									
Navigation	[Arrows]	Enter [Space]	Selected Item Info [1]	Home [Esc]					

Figure 123: Bad block recovery device information

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show the Bad Block Recovery item, as illustrated in the next figure, where the item is selected to be executed.

LEN0V0	Diagnostic	s UEF I			100×	Time 00:00 -	- Version XX.XX.XXX
	STO	RAGE 1: UMIS	RP1TJ256PED	2M#X-Phis	on Electroni	cs Corp.	
			ALGORITH	I SELECTIO	DN		
	[X]	Select / De					
	[X] Bad Block Recovery						
			Confi	irm [C]			
Navigation	n [Arrows]	Enter	[Space]	s	elected Iter	n Info []	Home [Esc]

Figure 124: Bad block recovery algorithm selection



If more than one device is available, the selected device will be shown accompanied by it's number, on the algorithm selection screen

That screen also allows seeing the algorithm details. To access this feature, the user has to press the I key when the Bad Block Recovery item is focused, leading to the exhibition of a popup with the algorithm information, as shown in the subsequent figure.

LEN0V0	Diagnostic	s UEF I	- 100 × 1 Time 00:00 - U	ersion XX.XX.XXX				
	\$10	RAGE 1: UMIS RPITJ256PE	D2MWX-Phison Electronics Corp.					
ALGORITHM SELECTION								
[X] Select / Deselect All Options								
	E V I	Bed Died. Deseuses.		_				
		BAD BLOCK REC	OVERY INFORMATION					
"Bad Block Recovery" is a storage tool that checks for bad blocks in the storage device and tries to fix them. The checking/recovery may take minutes to hours depending on supported features. Before running it, you should perform a complete backup.								
			0k					
Confirm [C]								
Navigation	[Arrows]	Enter [Space]	Selected Item Info [1]	Home [Esc]				

Figure 125: Bad block recovery information pop-up



Note

Once the Bad Block Recovery might perform write operations on a device, it may cause data loss. Consequently, the user must backup his or her data before running that operation.

In order to confirm the tool's execution, the user can use the "Confirm" button. After pressing the button, users will be met with a pop-up informing that, due to the operations executed, some data might be loss in the process, and a backup is suggested.



Figure 126: Bad block notice

If users choose the "Cancel" button, the operation is not going to proceed. If the "Ok" button is chosen, users will be met with the tool's execution screen, as seen bellow.

LEN0V0	Diagnostics UEFI	- - - - - - 100×	Time 00):00 - Versio	n XX.XX.XXX			
	8	AD BLOCK RECOVERY						
		TOOL EXECUTION						
S	TORAGE: UNIS RPITJ256PED2MWX	1025						
Se	erial Number: SSU17800321CD91J	1035						
	Started at:	2022/09/22	09:15:48					
	Bad Block Recovery: Finished at:	Progress [0000/00/00	2% J 00:00:00					
	Elapsed Time:							
				Stop Tool	[Esc]			
Total esti	mated time: 00:00:53 of 00:08	00						
Navigation	[Arrows]				Home [Esc]			

Figure 127: Bad block recovery execution

The Bad Block Recovery Execution screen provides information about the Bad Block Recovery tool progress, as well as its result when it has finished. This screen is composed of:

• Application Header Bar

- Screen Title Bar
- Screen Sub-title Bar
- Tool Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the tool, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize the algorithm execution details after finishing the tool execution. That section contains the following information:

- Final Result Code (an encrypted code that informs the algorithm's execution).
- Date and time that the operation has started.
- Bad Block Recovery (name of the algorithm being currently run).
- Progress of operation (algorithm's progress in percentage).
- The tool's algorithm can have these status:
 - **Progress** (plus the tool execution percentage), indicating the tool is being run.
 - **PASSED**, indicating the algorithm has found no problems at device.
 - WARNING, when applicable, indicating the algorithm has detected signs to the user be aware (for instance, of an imminent failure).
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
- Date and time that the operation is finished (displayed after it is finished).
- Result Code for the tool's algorithm.
- Elapsed time, that is a duration of the tool's algorithm in hours, minutes and seconds (displayed after it is finished).

While the tool is running, the user can stop it at any time by pressing the ESC key. If the user does that, the operation is aborted and its status is changed to CANCELED. After the operation is finished or canceled, the user can go back to the Home screen (by pressing ESC again) or visualize the tool log (by pressing the V key).

27 Data disposal

The system allows the user to access this tool by going to the Home screen, Tools, Data Disposal.

Data Disposal is a storage tool that erases all data from the storage device.



Data Disposal tool is available in Bootable (x64 / ARM) and Embedded ARM versions relying on the availability of the UEFI protocols and there is no machine restriction.

This tool has 2 options:

- Quick: Data Disposal Quick Tool is a storage tool that ou erases all partitions from a NVMe, SSD, HDD and USB by writing zero in MBR, GPT and GPT Backup table
- Extended: Data Disposal Extended Tool is a storage tool that erases all data from a NVMe, SSD and HDD by writing zeros in the entire disk.



Before running it, you should perform a full backup because either all data or partition will be erased from the disk (depending on which option was chosen)

After the user enters the Data Disposal option, the application will display the storage devices available in the system. The menu Device Selection is displayed, as shown in the next figure.

2	LENOVO	Diagnostics	UEFI			- 2 100×	Time 0	9:00 - Vers	ion XX.X	x.xxx
				DATA DIS	SPOSAL					
				DEVICE SE	LECTION					
		[X]	Select / De	eselect All Opt	tions					
		[X] :	samsung mzu	LB256HBHQ-000L	.7-Samsung	Electron	ics	(i)		
				Confir	n [C]					
	Navigation	[Arrows]	Enter	[Space]	Sel	ected Ite	n Info	ω	Home	(Esc)

Figure 128: Data disposal device selection

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. In order to continue, the user has to press ENTER in the "Confirm" button or use the shortcut "C". As a result, the system will show the Algorithm Selection for the Data Disposal item - "Quick", if there are partitions to be deleted; and always the "Extended" option, as illustrated in the next figure, where the item is selected to be executed.

ł	LENOVO	Diagnostic	5 UEFI		100×	Time 00:0	90 - Versi	on XX.XX.	xxx
		STORA	ge 1: Sa m sun	g MZVLB256HBHQ	-000L7-Sams	ung Elect	ronics		
				ALGORITHM SEL	ECTION				
		[]	Select / Des	elect All Option	15				
		נאז	Data Disposa	l Quick		(i)			
		[]	Data Disposa	1 Extended		(i)			
				Confirm [(
	Navigation	[Arrows]	Enter	[Space]	Selected	Item Info	[]]	Home CE	scl

Figure 129: Data disposal algorithm selection



If more than one audio device is available, the selected device will be shown accompanied by it's number, on the algorithm selection screen

That screen also allows seeing the algorithm details. To access this feature, the user has to press the I key when the Data Disposal item is focused, leading to the exhibition of a popup with the algorithm information, as shown in the subsequent figure.

LENOVO	Diagnostic	s UEFI		-	100 ×	Time 00:00 - Ve	rsion XX	.xx.xxx
STOR	AGE 1: SAMSUN	ig MZVLB256HB	HQ-000L7-Sa	msung Electron	nics Co.,	Ltd., Memory D	ivision	
ALGORITHM SELECTION								
	[X]	Select / De	eselect All	Options				
			DATA DISPO	SAL INFORMATIO	N			
	"Data Dis HDD devic complete as the da	sposal Tool" :e. The data . Before rum ata will not	is a storag erasing pro ning it, you be restoral	ge tool that en ocess may take a should perfon ble from the d	rases all a long t rm a comp isk.	data from ime to lete backup		
				Ok				
					_		J	
			Con	firm (C)	I			
Navigatio	m [Arrows]	Enter	[Space]	Sele	cted Item	Info []]	Hone	[Esc]

Figure 130: Data disposal information

In order to confirm the tool execution, the user can use the "Confirm" button. Consequently, the system will display a warning message about the data disposal process, as illustrated in the figure below.

LEN0V0	Diagnostics UEFI		- 100× Time 00:00	- Version XX.XX.XXX
		DATA DISPOSAL		
		TOOL EXECUTION		
		DATA DISPOSAL		
				_
	WARNING: All disk data please perform a comple process may take a long	will be erased and ete backup before us g time to complete,	will not be restorable ing this tool. The do you wish to continu	ь, ie?
	No [Esc]		Yes	
				_
			Stor	n Tool [Esc]
Total esti	nated time: 00:00:00 of 00:	:00:20		
Navigation	[Arrows]			Hone [Esc]

Figure 131: Data disposal warning message

After reading the warning message, the user can confirm the tool's execution. Consequently, the system will start the data disposal process, as displayed in the figure below.

LENOVO	Diagnost	ics UEFI		- = <mark>567.</mark> •	Time	17:08 - Vei	rsion XX.XX	x.xxx
			DATA DISP	OSAL				
		T	OOL EXECU	TION				
	STORAGE: UM Serial Numbr 85 Code: 85 Sta Dat Dat Fin	IS RPJTJ256MGE1QDQ er: SSOL25209X1RC19G10 SSOL25209X1RC19G10B2 arted at: a Disposal Quick: a Disposal Extended: hished at:	9 8 2	2023/11/22 17:0 PASSED Progress [0/] 0000/00/00 00:0	8:30 0:00			t
	STORAGE: San Sta Dat	nDisk 3.2Gen1 Inted at: a Disposal Quick:		0000/00/00 00:0	0:00			
			<u>^</u>		L	Stop Tool	l (Esc)	
fotal est	imated time	: 00:00:10 of 00:00:4	U					
Navigation	n [Arrows]			PgUp (F91	Pg	1Dn [F10]	Home [Esc]

Figure 132: Data disposal execution

The Data Disposal Execution screen provides information about the data disposal progress, as well as its result when it has finished. This screen is composed of:

- Application Header Bar
- Screen Title Bar
- Screen Sub-title Bar
- Tool Information Section
- Instruction Footer Bar

The Application Header Bar contains the name of the application, system's time and application's current version; the Screen Title and Screen Sub-title Bars help the user to be attentive of where s/he is throughout the application; and the Instruction Footer Bar contains additional instructions for using the screen, as well as the Exit button.

The screen has one main section that provides information about the tool, as well as a progress bar and a View Log button, both placed at the bottom of the section, where the former indicates the global execution progress and the latter allows to visualize the algorithm execution details after finishing the tool execution. That section contains the following information:

- Final Result Code (an encrypted code that informs the algorithm's execution).
- Date and time that the operation has started.

- Data Disposal (name of the algorithm being currently run).
- · Progress of operation (algorithm's progress in percentage).
- The tool's algorithm can have these status:
 - **Progress** (plus the tool execution percentage), indicating the tool is being run.
 - **SUCCESS**, indicating the algorithm has found no problems at device.
 - FAILED, indicating the algorithm has found one or more faults.
 - CANCELED, indicating the algorithm has been canceled by user.
 - **NOT APPLICABLE**, indicating the algorithm is not supported by device.
- Date and time that the operation is finished (displayed after it is finished).
- Result Code for the tool's algorithm.
- Elapsed time, that is a duration of the tool's algorithm in hours, minutes and seconds (displayed after it is finished).

28 SMART information

The system allows the user to access this tool by going to the Home screen, Tools, SMART Information.

SMART Information is a tool used to obtain information related to the hardware condition, reported by the S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) monitoring system of HDDs, SSDs and NVMe devices , in order to prevent imminent hardware failures.

After the user enters the SMART Information option, the application will display the storage devices available in the system. The menu Device Selection is displayed, as shown in the next figure.

*	LENOVO	Diagnostics	5 UEFI		- - - 100×	Time 00:	00 - Vers	ion XX.XX.XXX
				SMART INFO	RMATION			
				DEVICE SE	LECTION			
		[X]	SAMSUNG MZ	JLB256HBHQ-000L	7-Samsung Elect	ronics	(i)	
				Confirm	i (C)			
	Navigation	[Arrows]	Enter	[Space]	Selected	Item Info	[]]	Home [Esc]

Figure 133: SMART information - device selection

An item can be selected/deselected by pressing SPACE when it is highlighted. A desired item is selected when it shows "[X]" preceding it. In order to continue, the user has to press ENTER in the "Confirm" button. As a result, the system will show the SMART Information, as illustrated in the next figure.

LENO	JO Diagnostics UEF	I		- - = <u>100×</u> ∎ т	ime 00:00 - Versi	ion XX.XX.XXX
		SMART	INFORMATION			
		Displays SMART at	tributes and	l its values		
ID	Name	Value	Threshold	Raw Value	Hex Raw	
1	Read Error Rate	100	θ	θ	θ	1
2	Throughput Performance	e 100	50	0	θ	
3	Spin-Up Time	100	50	0	θ	
5	Reallocated Sectors C	count 100	50	θ	θ	
7	Seek Error Rate	100	50	0	θ	
8	Seek Time Performance	100	50	θ	θ	
9	Power-On Hours	100	0	5296	14B0	
10	Spin Retry Count	100	50	0	θ	
12	Power Cycle Count	100	0	1735	6C7	
167	Unknown	100	0	0	θ	
168	Unknown	100	0	0	θ	
169	Unknown	100	10	100	64	
170	Available Reserved Sp	ace 100	10	0	θ	1
	Refresh (R)			Ехро	rt SMART Inform	ation [F2]
Nav ig	ation [Arrows]	Enter [Space]	PgUp	[F9]	PgDn [F10]	Home [Esc]

Figure 134: SMART information screen

Value and Threshold columns are not displayed for NVMe devices as they don't provide these values, as illustrated in next figure:

\$ LENO	VO Diagnostic	s UEFI	- i = <mark>61%</mark> !	Time 17:13 - Versio	on XX.XX.XXX
		SMA	RT INFORMATION		
		Displays SMART	attributes and its valu	es	
ID	Name		Raw Value	Hex Raw	
1	Critical Warning		0	θ	Ť
2	Composite Temper	ature	301	12D	
3	Available Spare		100	64	
4	Available Spare	Threshold	10	A	
5	Percentage Used		0	0	
6	Endurance Group	Critical	0	θ	
	Warning				
7	Data Units Read		41233834	2752DAA	
8	Data Units Writt	en	1713753	1A2659	- 81
9	Host Read Comman	ds	95390901	5AF8CB5	- 8
10	Host Write Comma	nds	18066910	113ADDE	- 8
11	Controller Busy	Time	894	37E	- 8
12	Power Cycles		916	394	1
	Refresh [R]			Export SMART Informa	tion [F2]
Nav i	gation [Arrows]	Enter [Space]	PgUp [F9]	PgDn [F10]	Home [Esc]

Figure 135: NVMe SMART information screen

29 Fan speed tool

The Fan Speed Tool allows users to monitor the speed of CPU fan and the current CPU temperature, to check if the fan is working as expected.

To access the tool, user may select it on the applications main menu, either by clicking it or by pressing F7 key.

4	LENOVO	Diagnostics	s UEFI		35	<mark>Z</mark> -	Time 11:53 -∨	ersion XX.XX.X	XX
				HO	ME				
			DIAGNO	STICS			TO	OLS	
	STORAGE	[5]		MEMORY (E)			SYSTEM INFO	RMATION (F1)	
	BATTERY	[J]		CPU [U]			BAD BLOCK RI	ECOVERY [F3]	
	DISPLAY	(D)		Fan [F]			DATA DISP	'OSAL [F4]	
	KEYBOARI) [К]		MOTHERBOARD [H]	1		SMART INFOR	MATION (F5)	
	mouse (1	n					Fan Spe	ED (F7)	
				RUN ALL	[R]				
	Some	of the modul	es have	BIOS internal pro	tocols dependen	icy a	nd may not be	displayed	
				-	-	_	_		
	Navigatio	n [Arrows]	En	ter [Space]	About I	[A]		Exit EEso	:]

Figure 136: Fan speed tool location, on main menu

Upon entering the tool, users will be met with a warning, informing about the necessity of having a keyboard connected, as during the execution mouse and touchpad navigation will be disabled, giving the user options to proceed and cancel the tool's execution. If the user chooses to cancel, the application will be redirected back to the main menu. Otherwise, the tool will close the warning and proceed to the tool's screen.



Figure 137: The tool's startup notice

On the tool's screen, the user is able to visualize the current temperature of the CPU, the current fan speed, and to monitor the temperature and speed variance in a 1 second window. The tool registers the information each second and projects it on a

graph, in the middle of the screen.



Figure 138: The tool's main screen

The tool also allows the user to change the speed of the fan, that can be controlled by the "Low", "Medium" and "High" buttons. Aside from this, the toos allows the users to change the temperature between Celsius and Fahrenheit, with the use of two buttons next to the speed ones. To navigate between all of this buttons, users must make use of the keyboard's arrow keys.

To exit the tool, the user must press ESC key. After pressing it, a message reading "Exiting the Tool, please wait..." will appear under the graph, above the screen footer.

30 Exit the application

To exit the application, the user must select the option "Exit" on the Home screen and press the ENTER key. Then, the interface will be closed and the machine will be reset.

31 Resources by platform

Module/Tool	x86	ARM
Audio	\bigcirc	
Bad Block Recovery	Ø	
Battery	\bigcirc	8
CPU	Ø	
Data Disposal	\bigcirc	
Display	Ø	8
Fan	\bigcirc	8
Fan Speed Tool	Ø	8
Fingerprint	\bigcirc	8
Hardware Diagnostic Events	Ø	8
Keyboard	Ø	\bigcirc
Memory	Ø	
Motherboard	Ø	\bigcirc
Mouse	\bigcirc	
Optical	Ø	8
RAID	\bigcirc	8
Run All	\bigcirc	⊘
Sensor	Ø	8
SMART Information	Ø	⊘
Storage	Ø	\bigcirc
System Information	⊘	⊘
Touch	Ø	8
WiFi	⊘	8
Wired Ethernet	\bigcirc	\bigcirc

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Lenovo Diagnostics for UEFI

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