Lenovo

Lenovo Diagnostics UEFI Embedded/Bootable v04.34.001

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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.

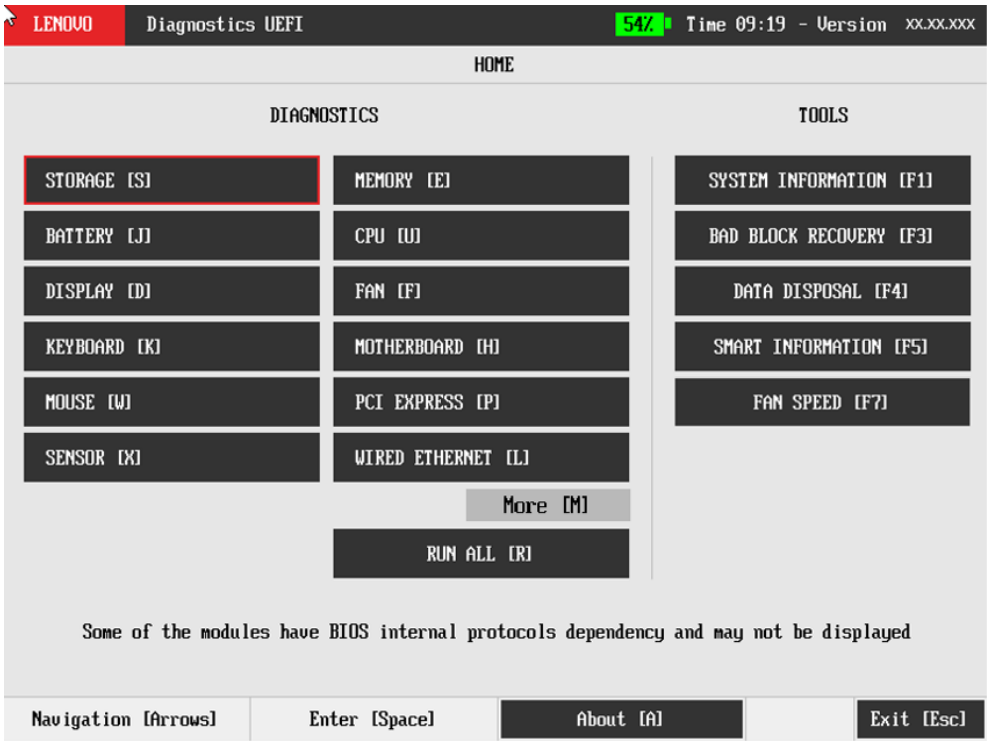

Figure 1: Home screen 1 - bootable version

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.

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

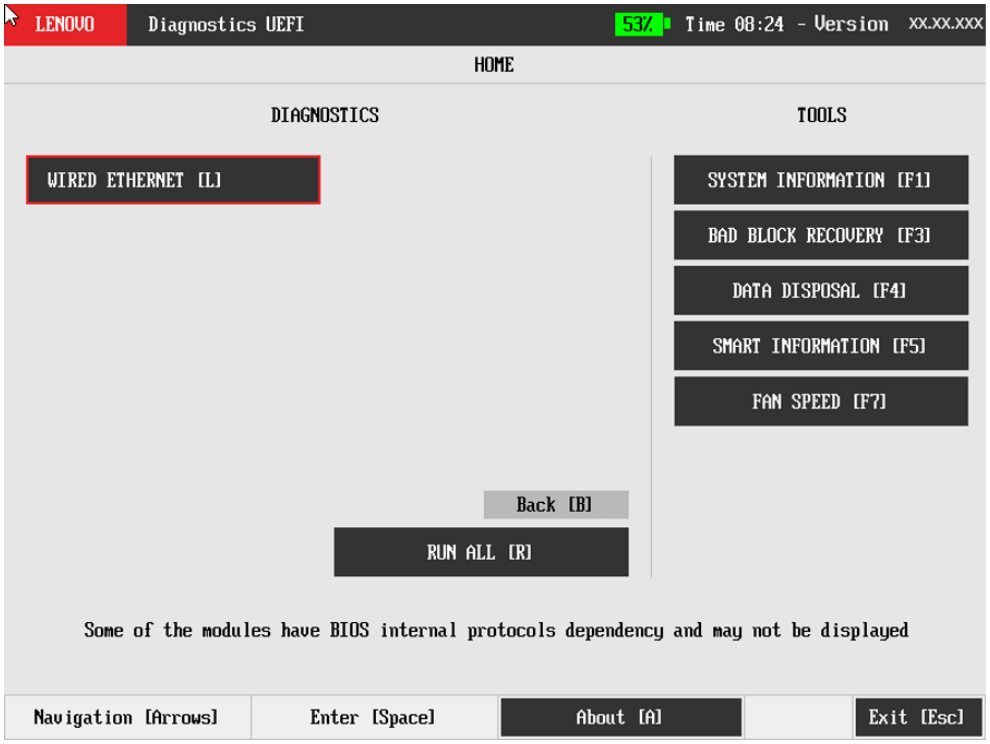

Figure 2: Home screen 2 - bootable version

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 (**‹v^›**) 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.

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.

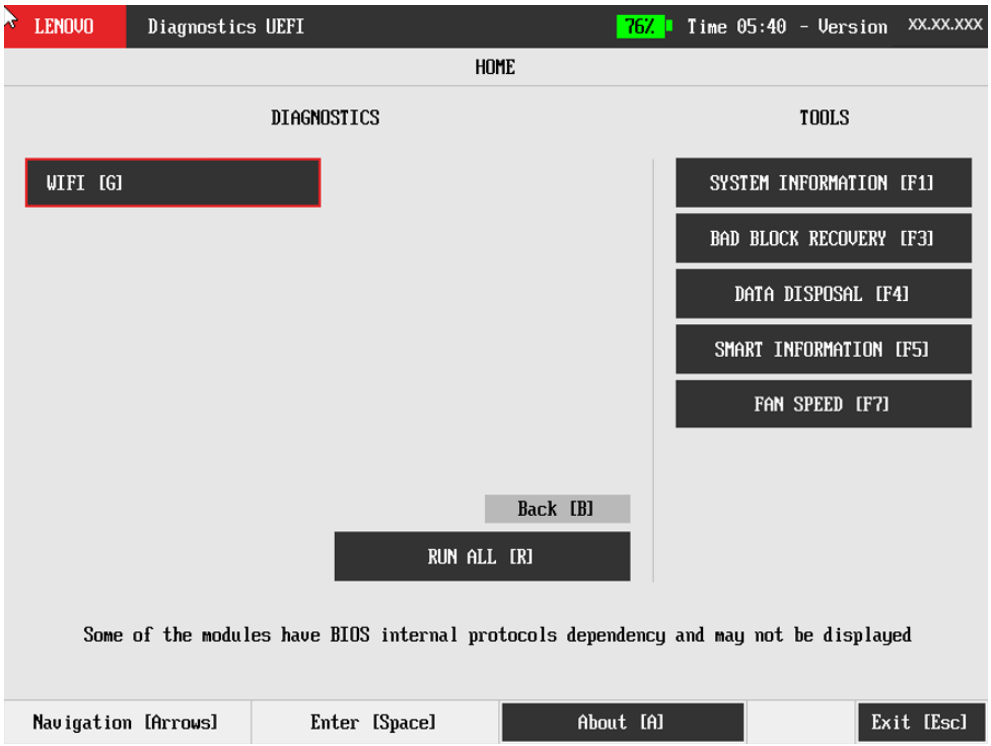

Figure 4: Home screen 2 - embedded version

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**

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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 (**‹v^›**) and enter the selected option by pressing SPACE or ENTER.

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  - Quick: It selects and runs the memory quick diagnostics.
  - Extended: It selects and runs the memory extended diagnostics.
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  - Quick: It selects and runs the touch diagnostics.
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- 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:

```
        for %a in 0 1 2 3 4 5 6 7 8 9
                if exist f%a:startup.nsh then
                        set L fs%a:
                        %L%
                endif
        endfor

        %L%

        <UEFI Application Name>.efi
```

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]
                }
                ]
        }
        ]
}
```

Table 1: List of parameters and their explanation

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 executed 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 standards using ModuleShortName. CP_Q is for CPU quick and ME_E is for memory extended.

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 device 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 deviceId inside execution vector, it follows the Shell View app standards 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.

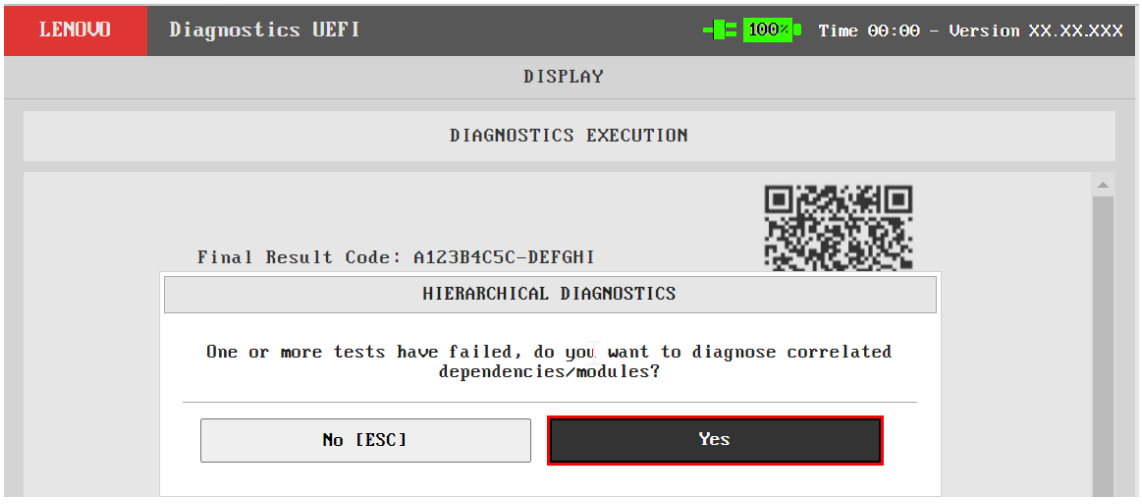

Figure 5: Hierarchical diagnosis confirmation pop-up

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

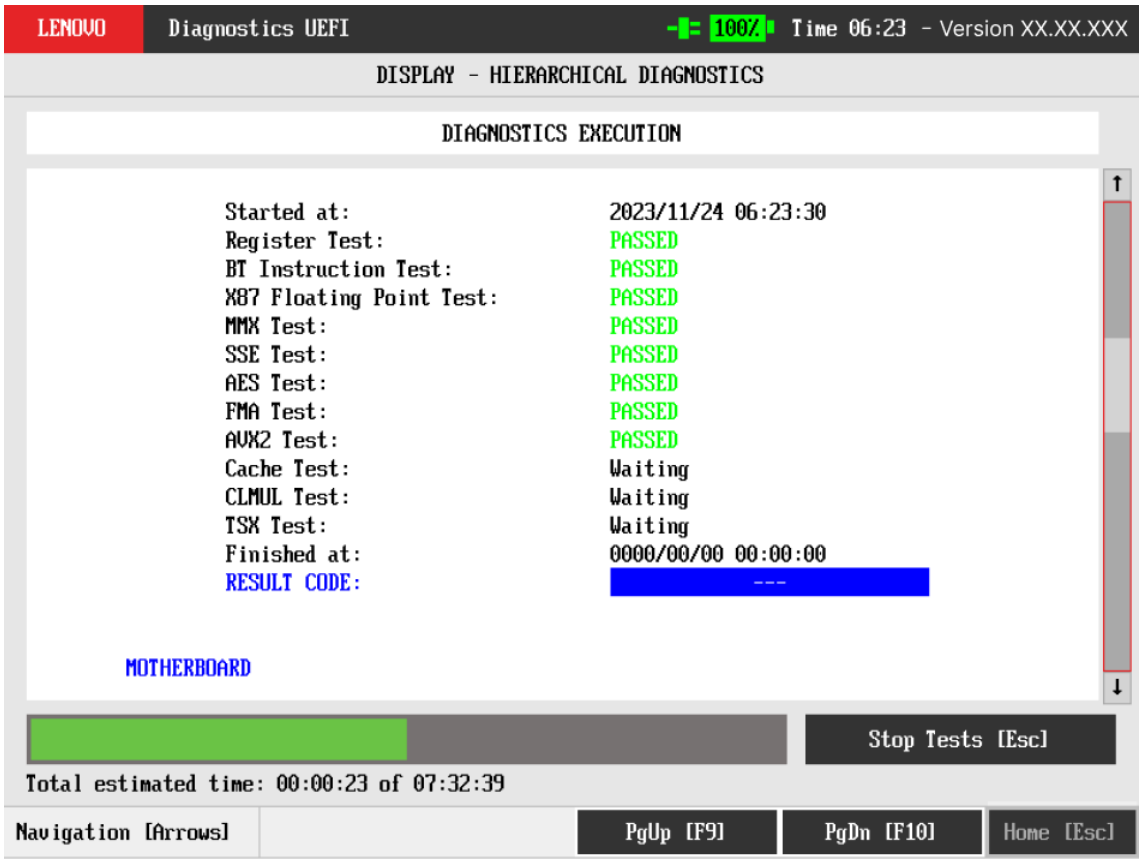

Figure 6: Hierarchical diagnosis execution

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.

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.

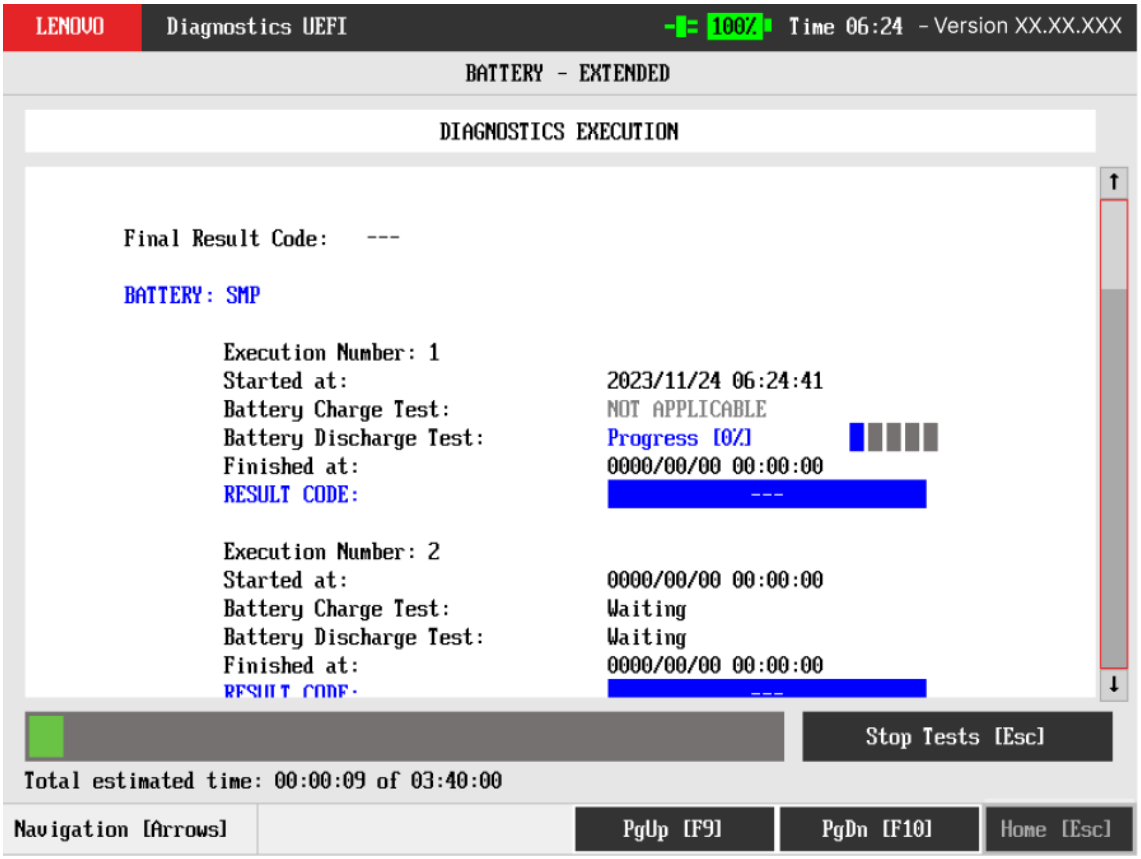

Figure 8: Times to run Diagnostics execution example

- 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.

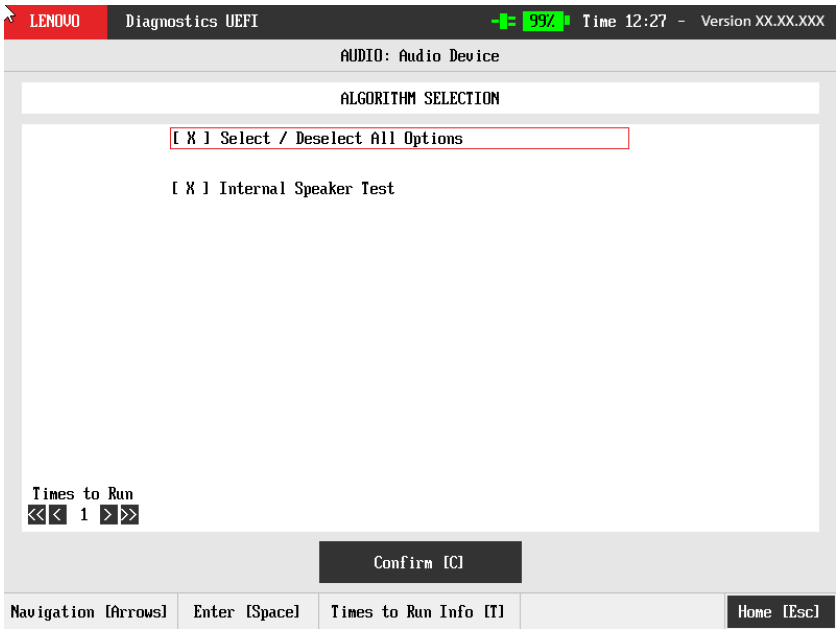

Figure 9: Audio algorithm selection

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

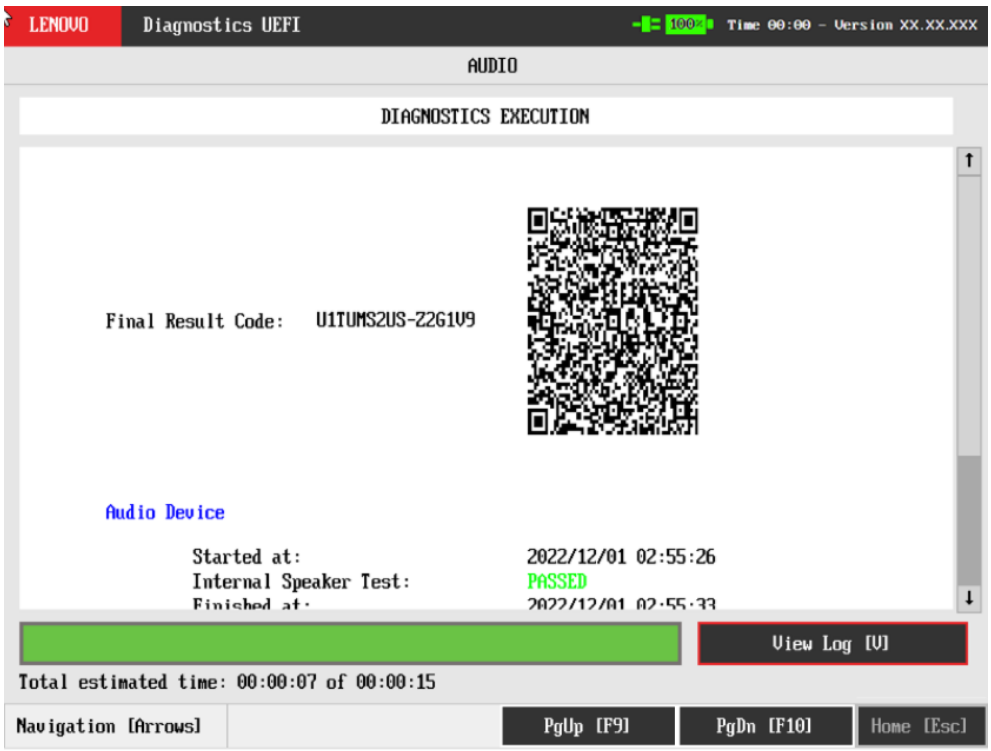

Figure 10: Audio diagnostics execution

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.

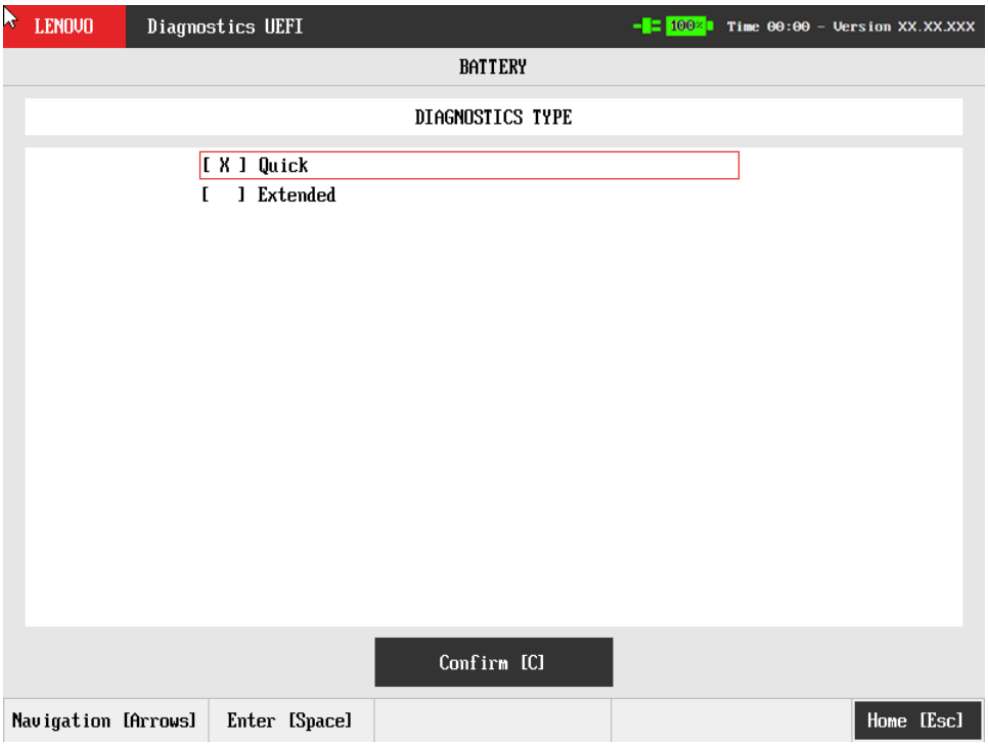

Figure 11: Battery diagnostics type

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.

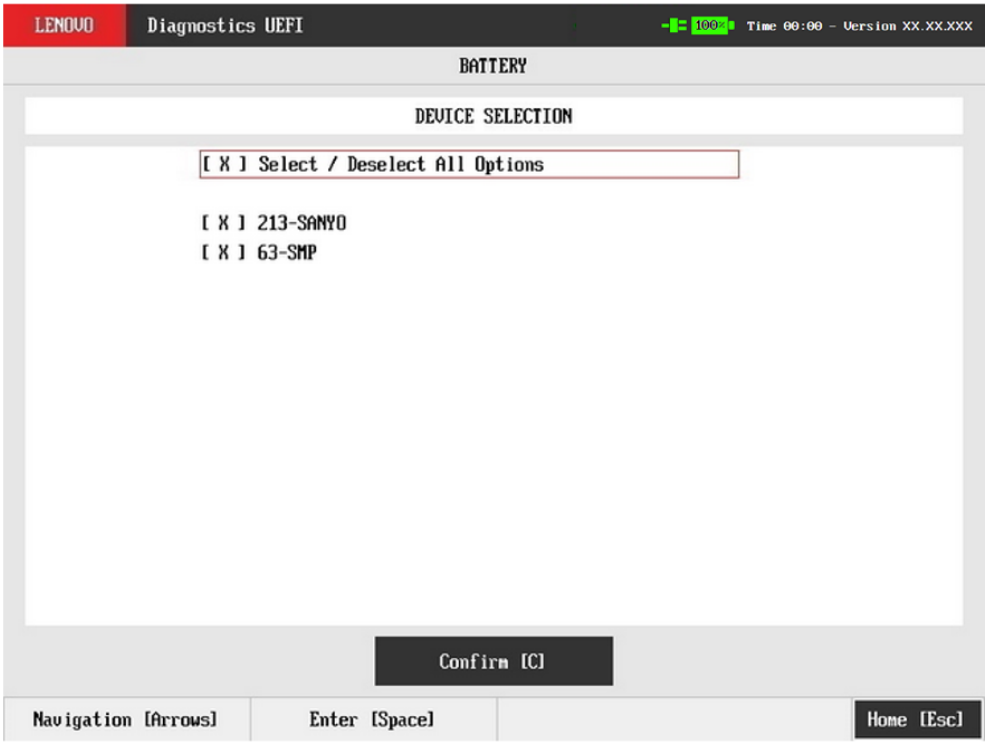

Figure 12: Battery device selection

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:

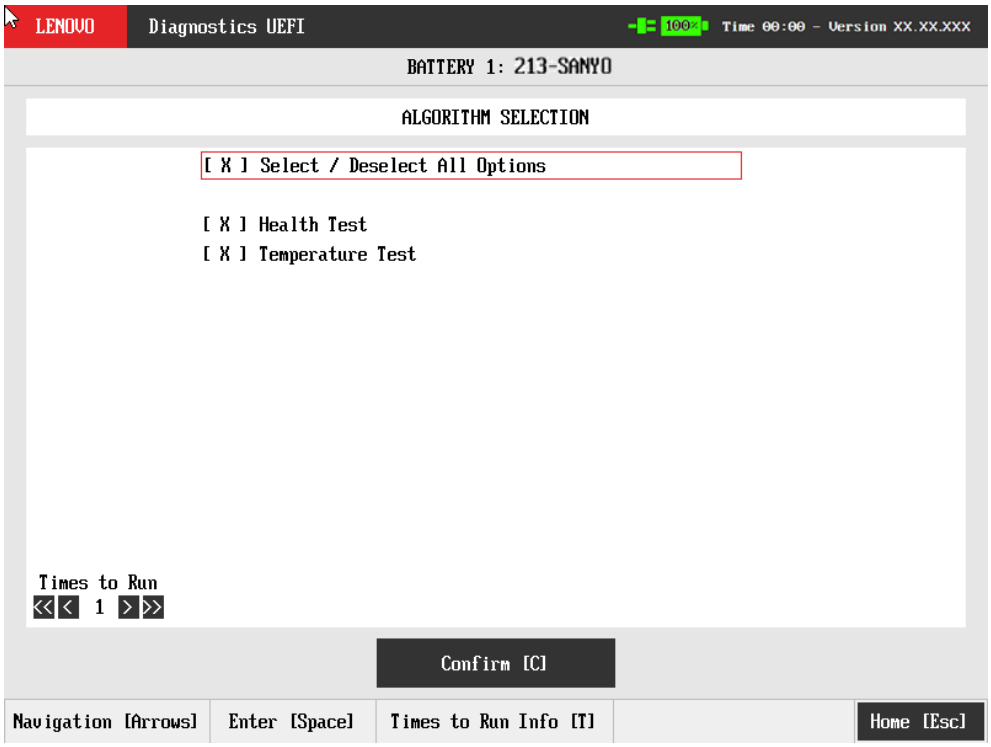

Figure 13: Battery quick algorithm selection

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

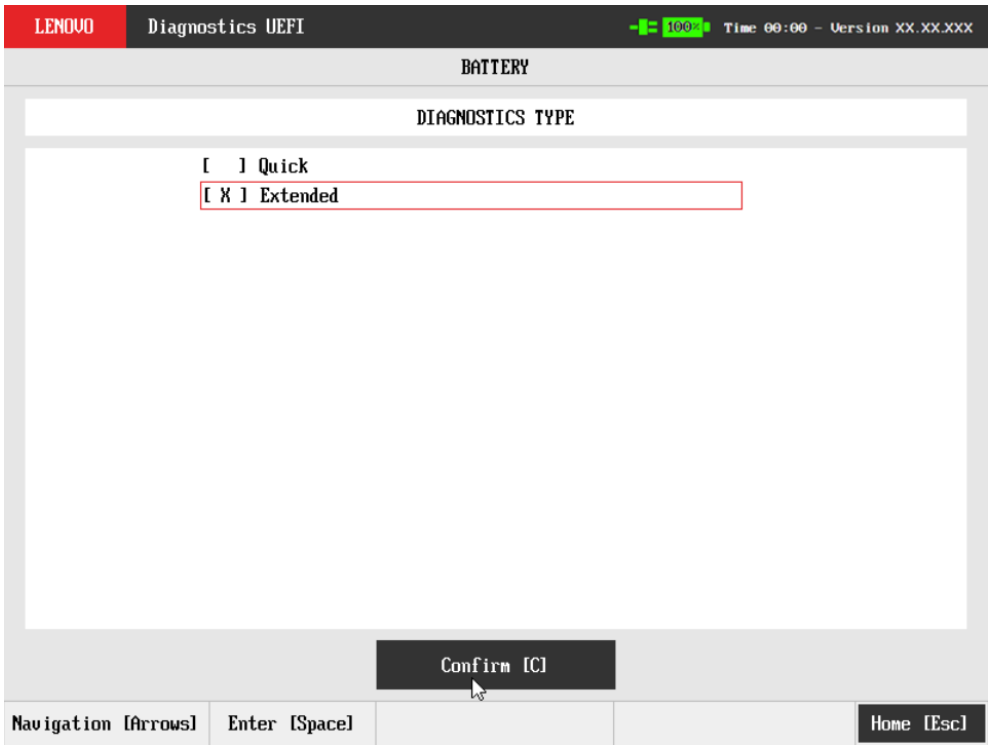

Figure 14: Battery extended type selection

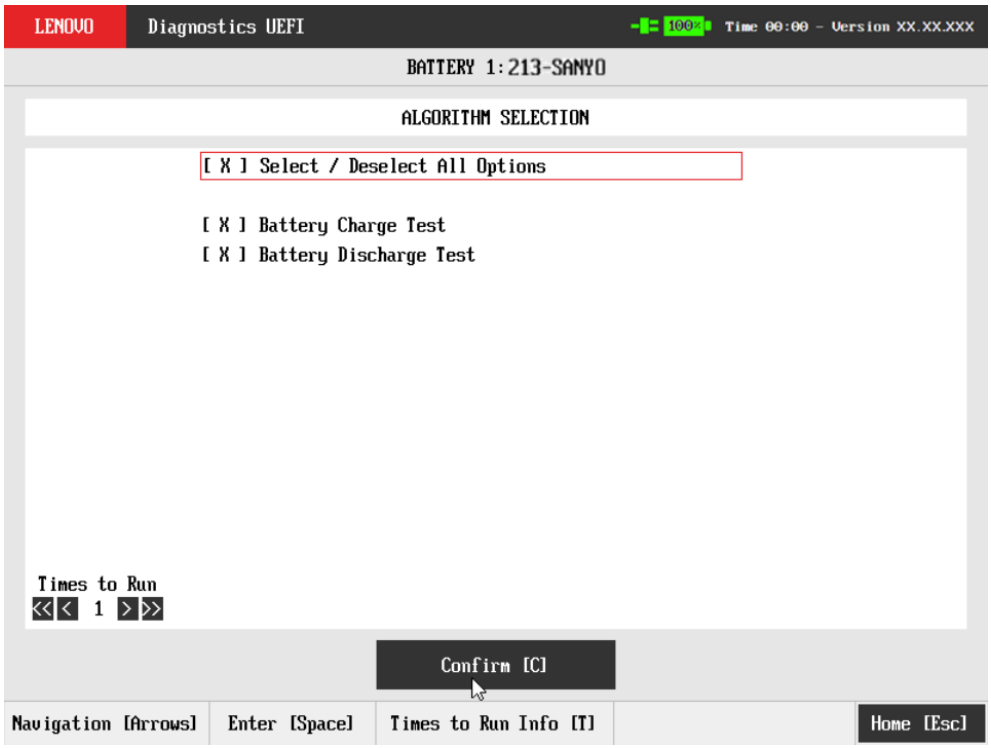

Figure 15: Battery extended algorithm selection

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

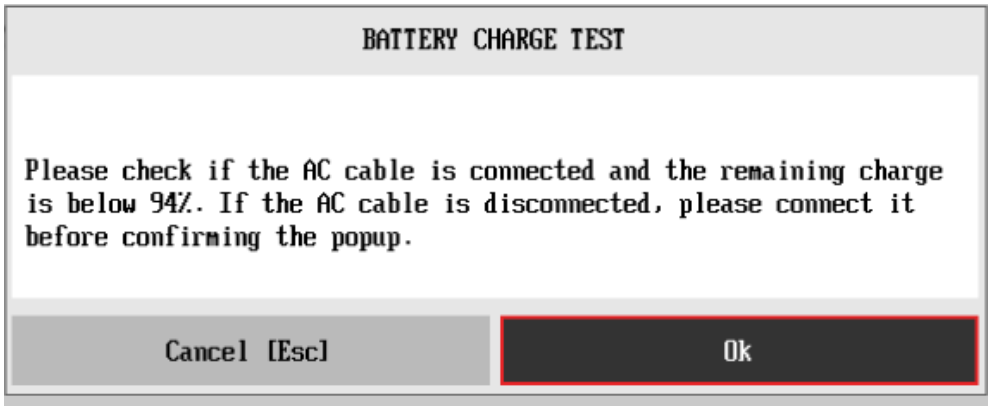

Figure 16: Battery charge test pop-up

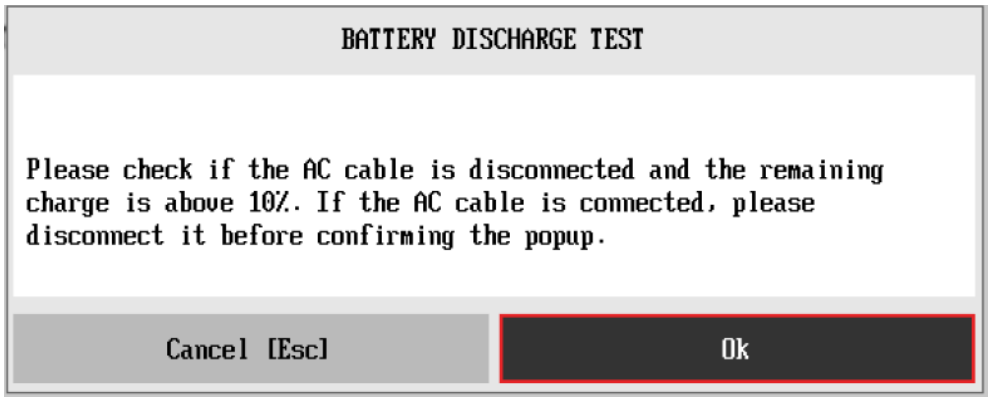

Figure 17: Battery discharge test pop-up

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.

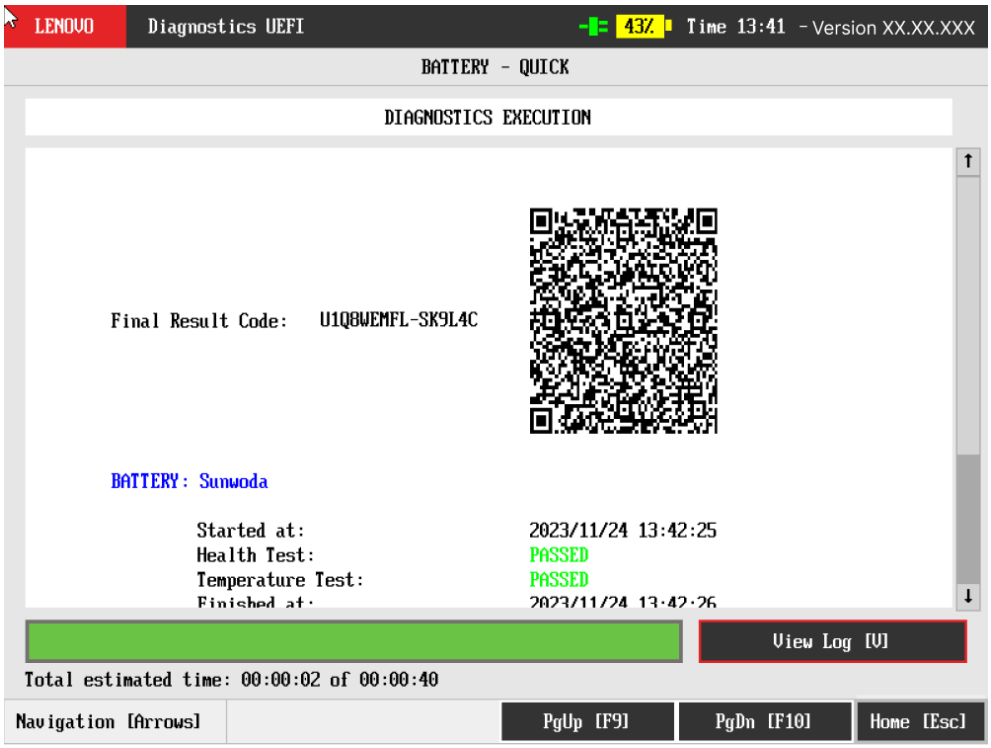

Figure 18: Battery quick diagnostic execution

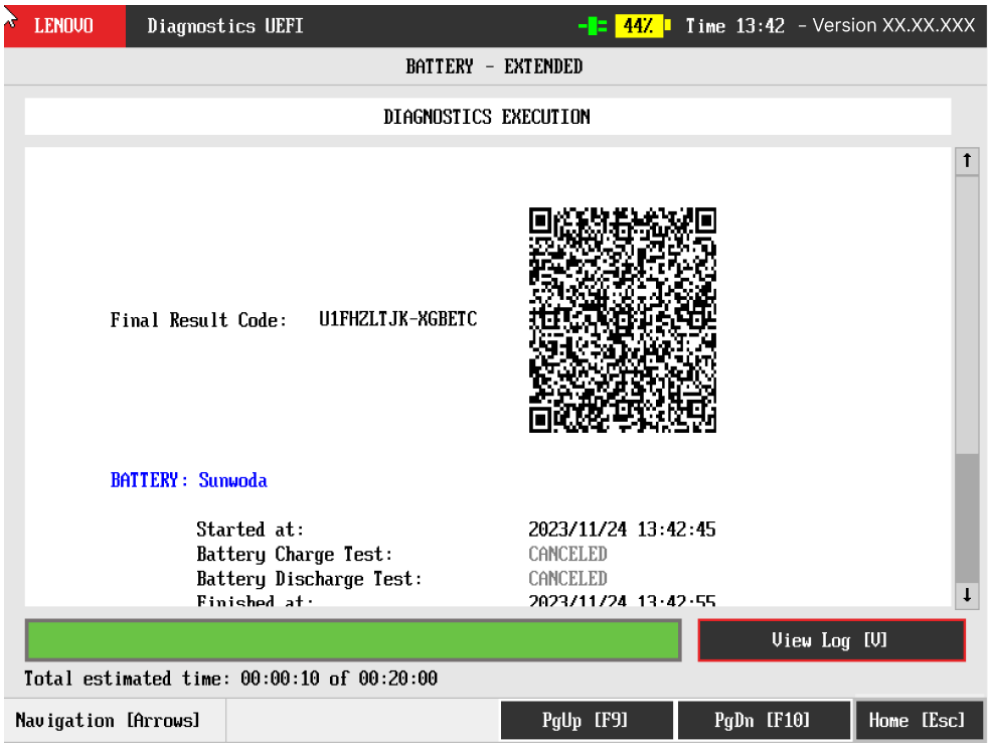

Figure 19: Battery extended diagnostic execution

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.

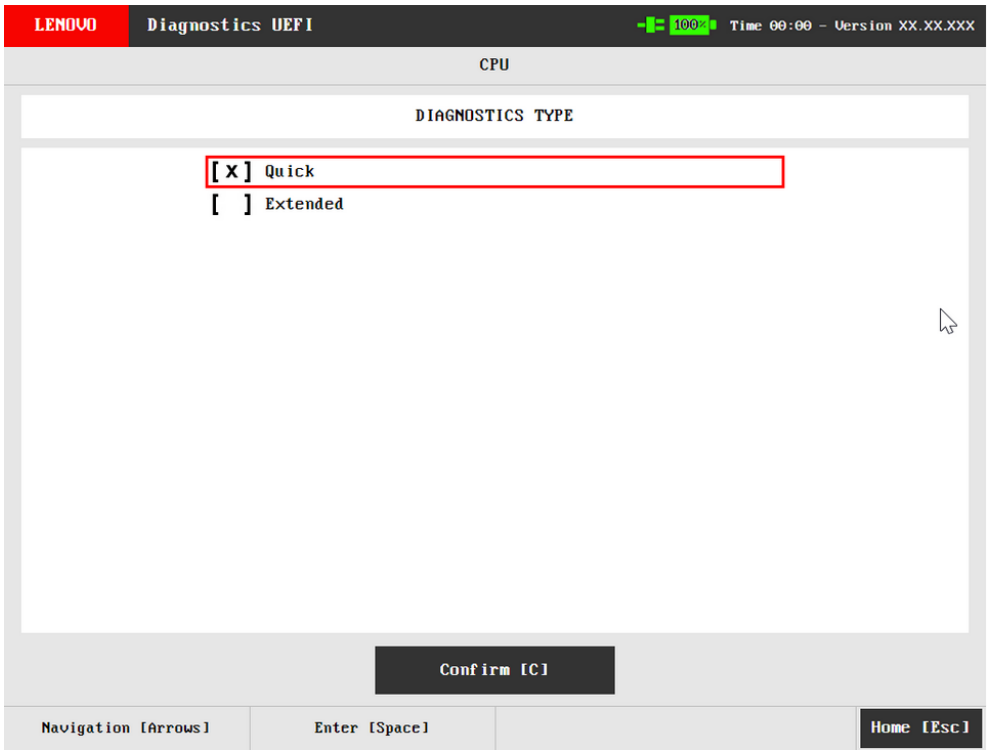

Figure 20: CPU diagnostics type

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.

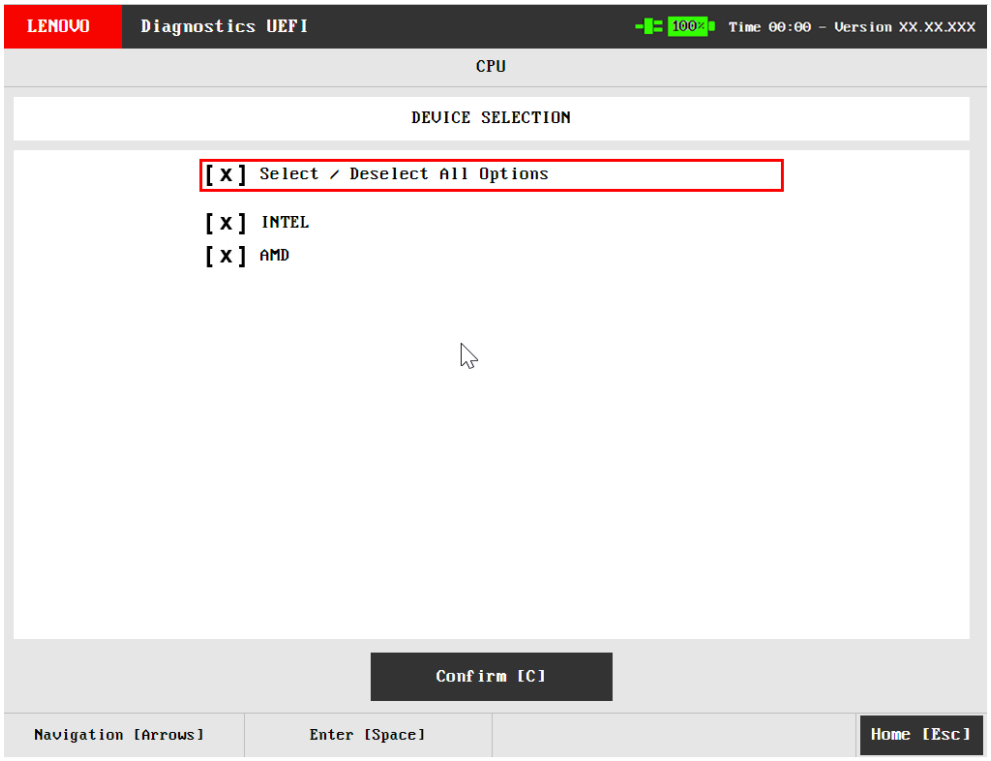

Figure 21: CPU device selection

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.

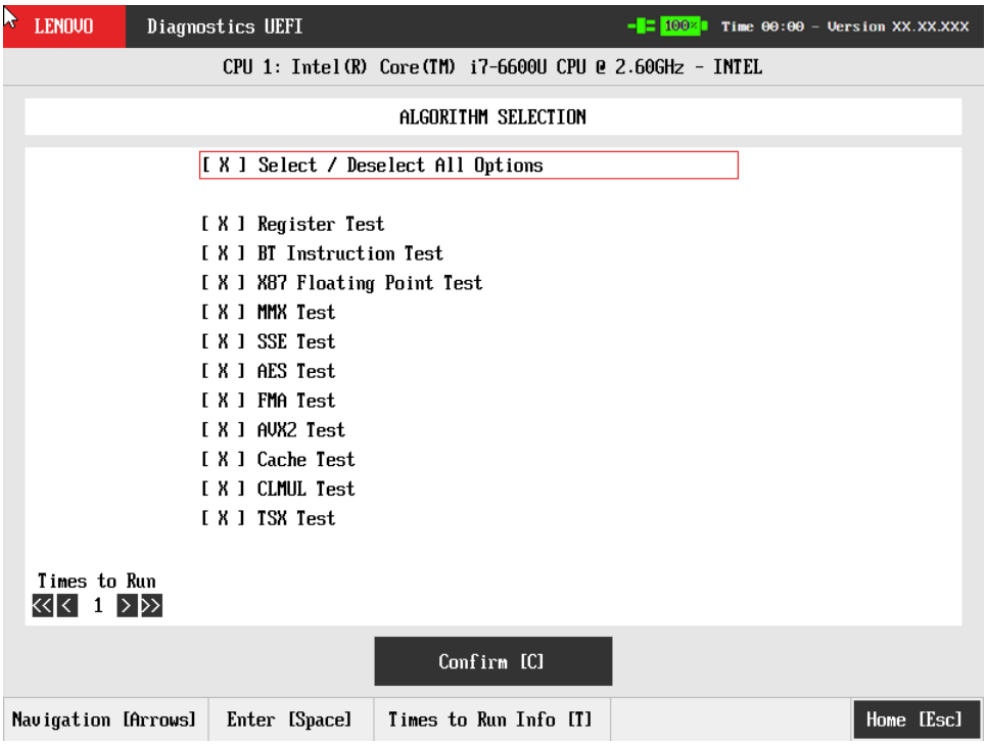

Figure 22: CPU algorithm selection

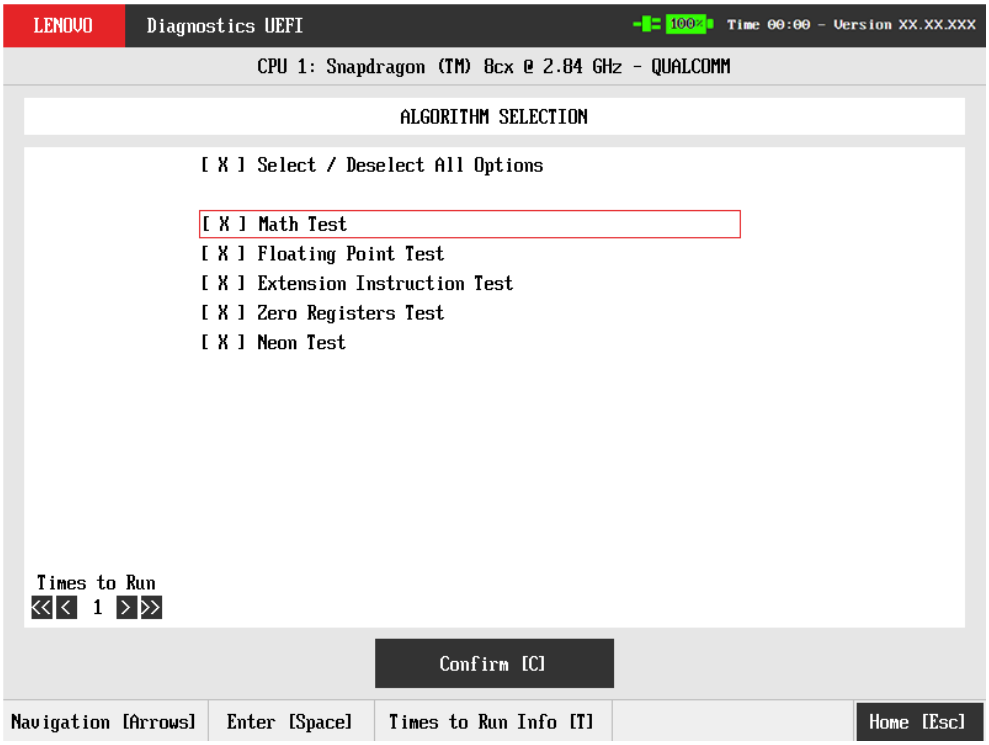

Figure 23: CPU algorithm selection - ARM version

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.

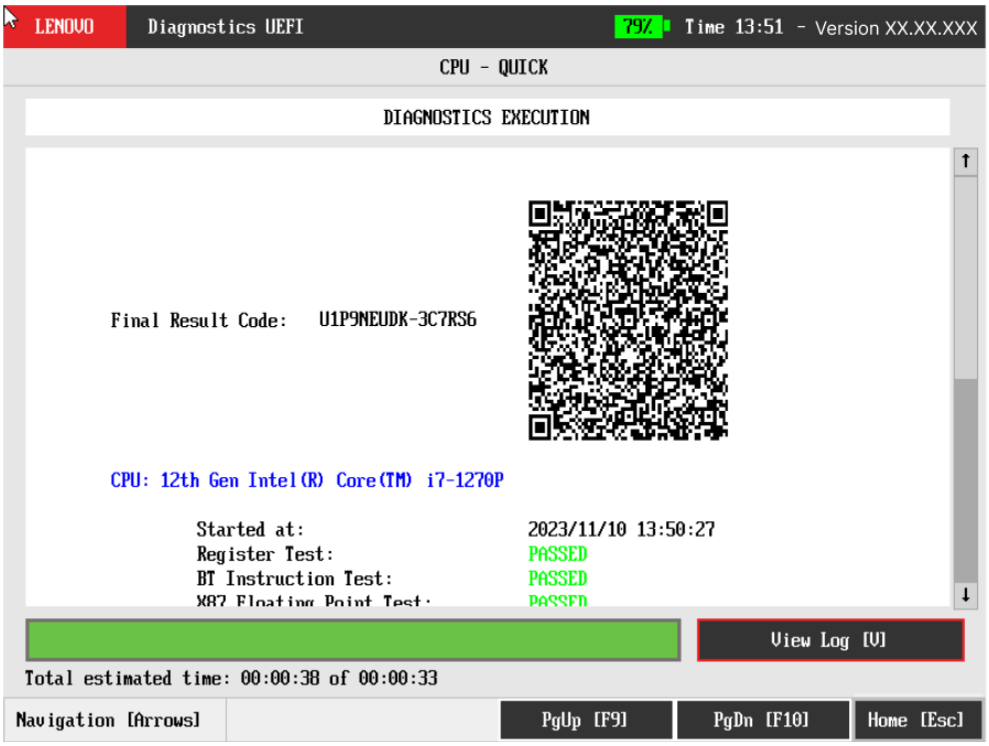

Figure 24: CPU quick diagnostics execution

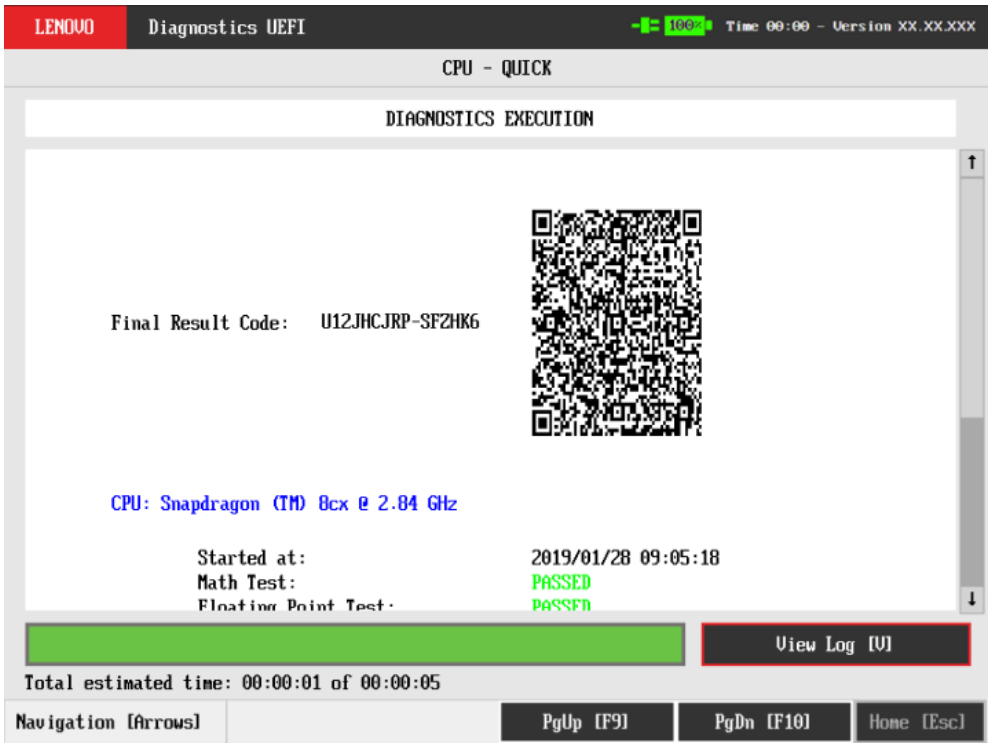

Figure 25: CPU quick diagnostics execution - ARM version

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).

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).

8.2 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.

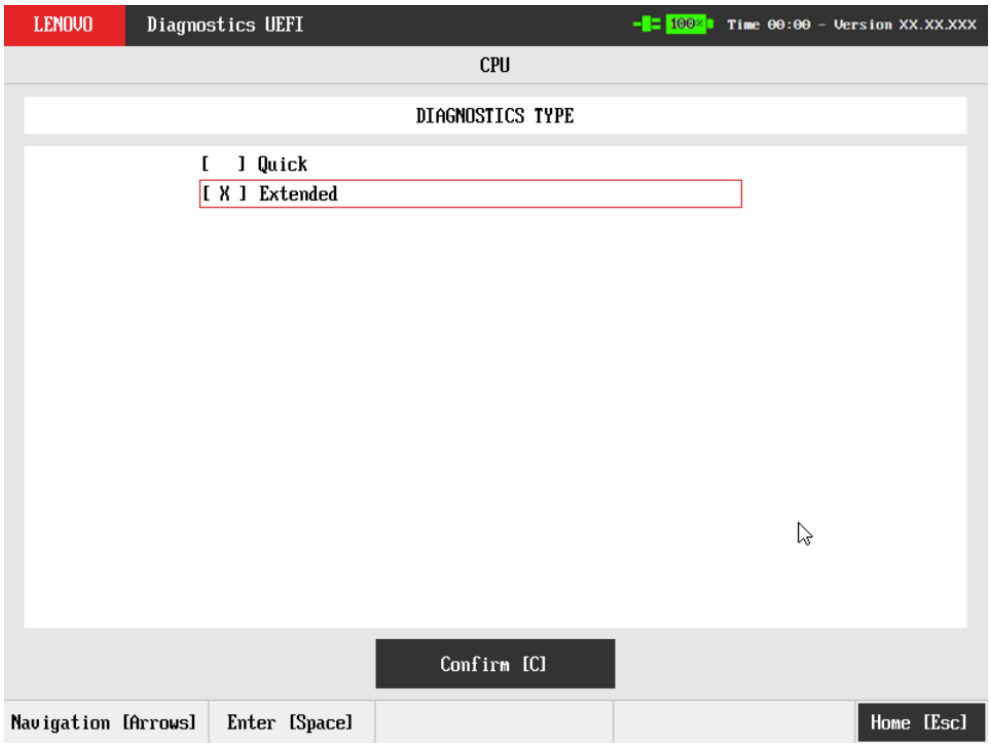

Figure 26: CPU diagnostics type

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.

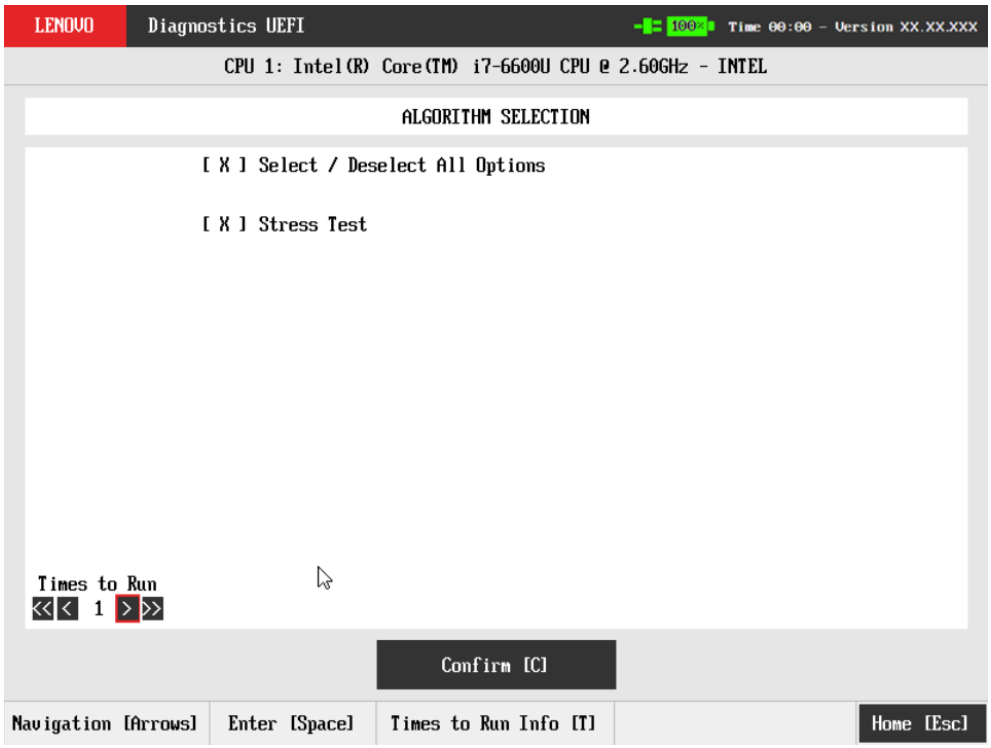

Figure 27: CPU algorithm selection

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.

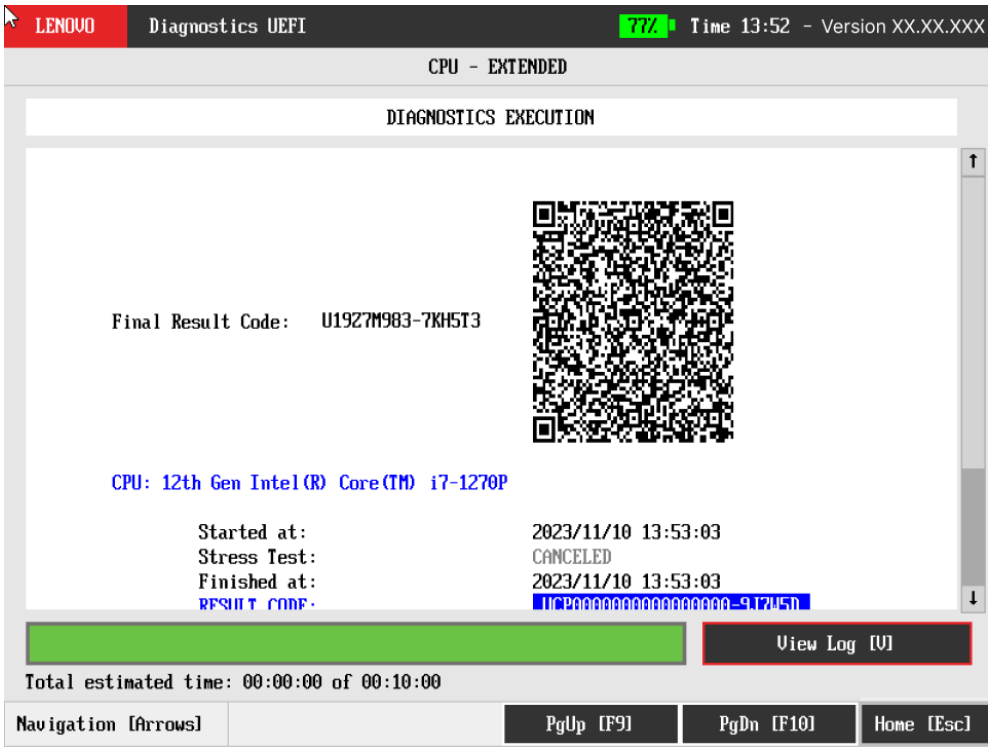

Figure 28: CPU extended diagnostics execution

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).

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).

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.

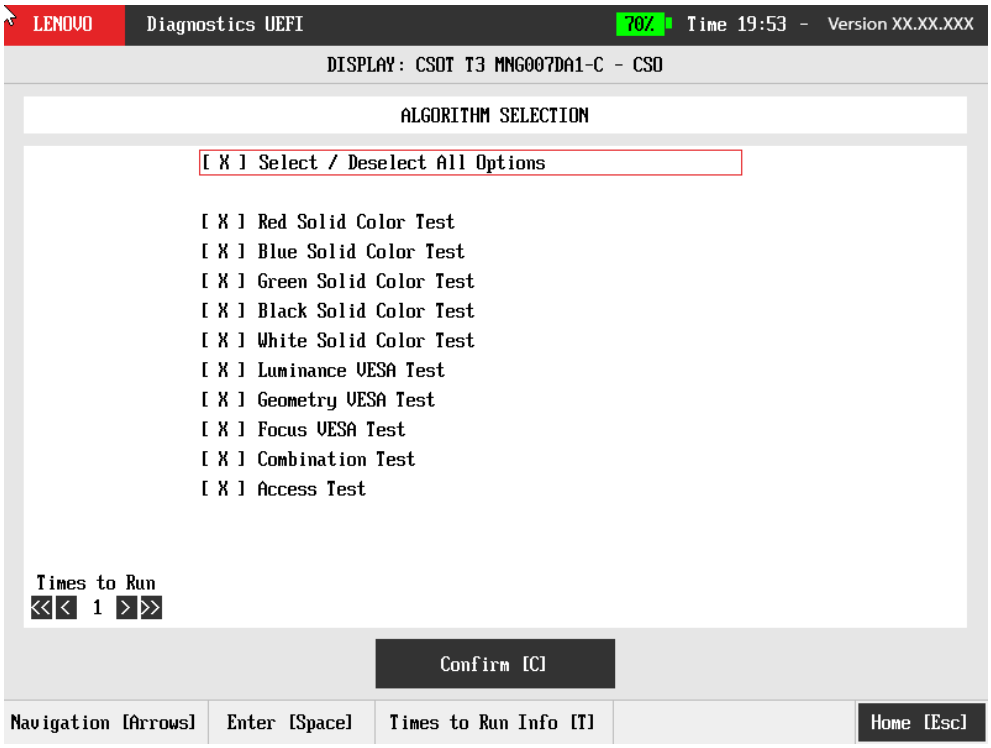

Figure 29: Display algorithm selection

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.

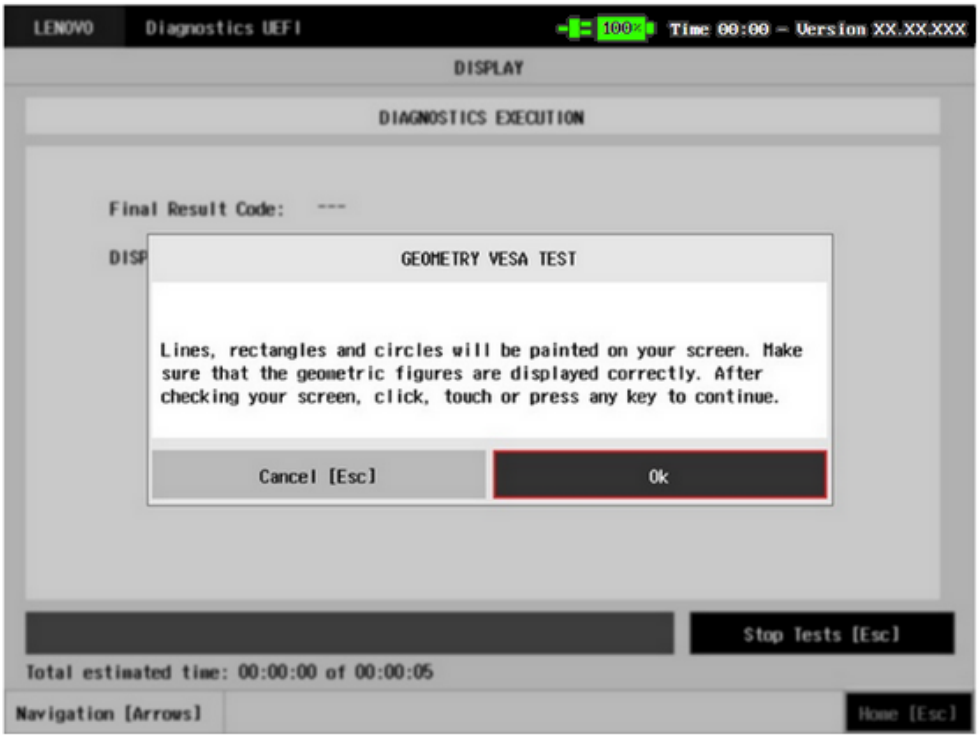

Figure 30: Display test instruction pop-up

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.

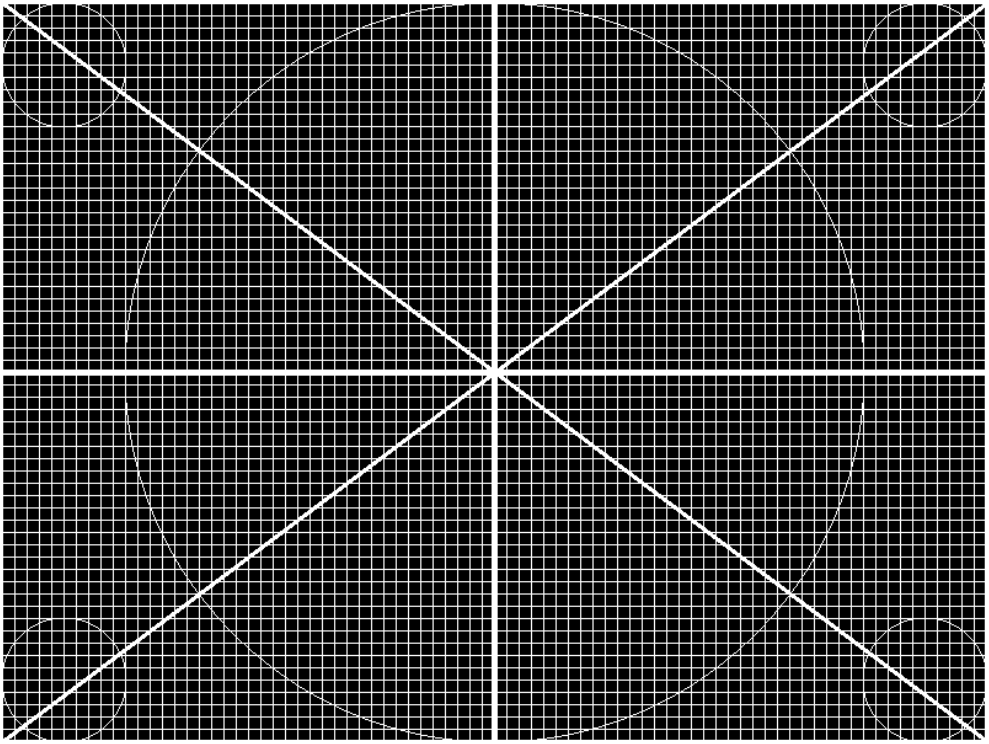

Figure 31: Geometry VESA test

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.

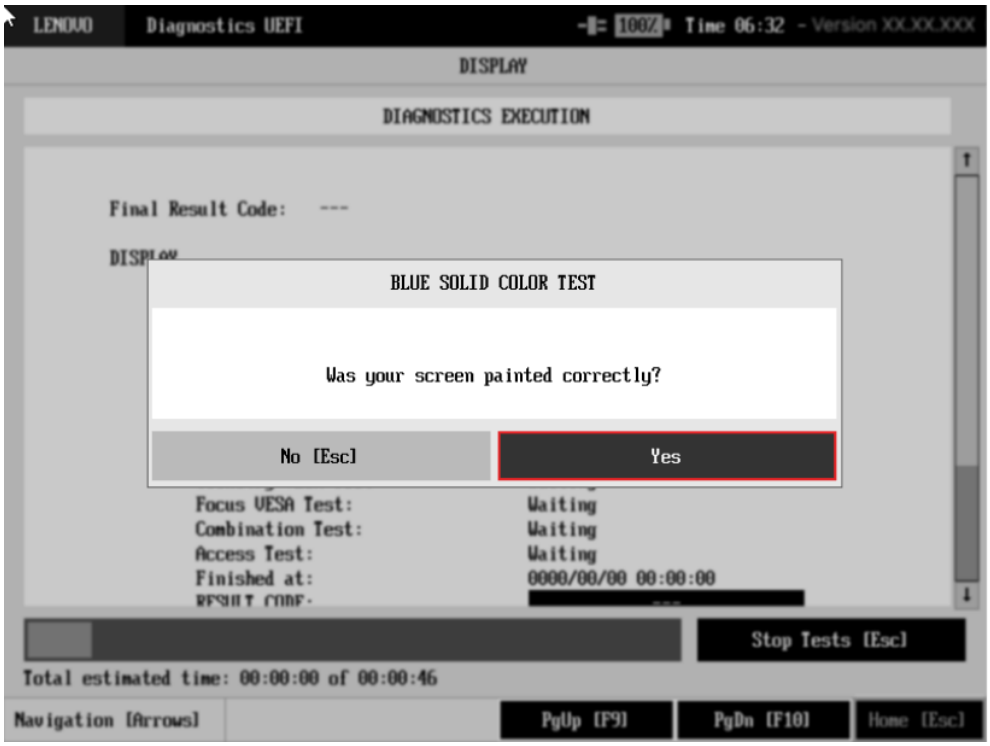

Figure 32: Display test result inquiry popup

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.

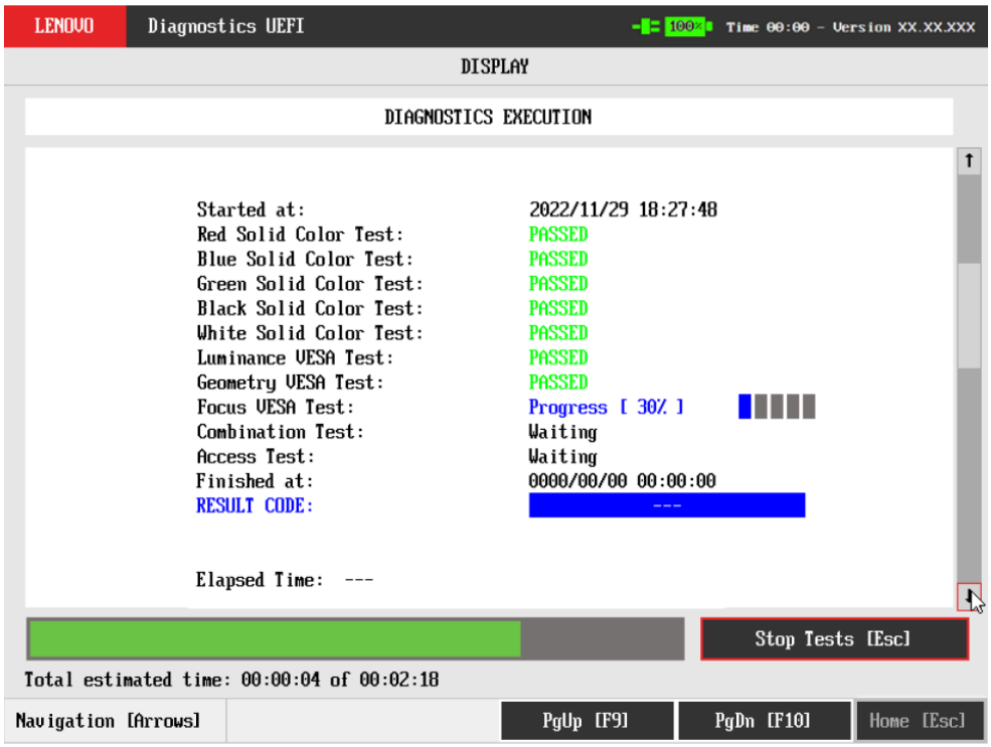

Figure 33: Display diagnostics execution

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).

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).

10 FAN

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.

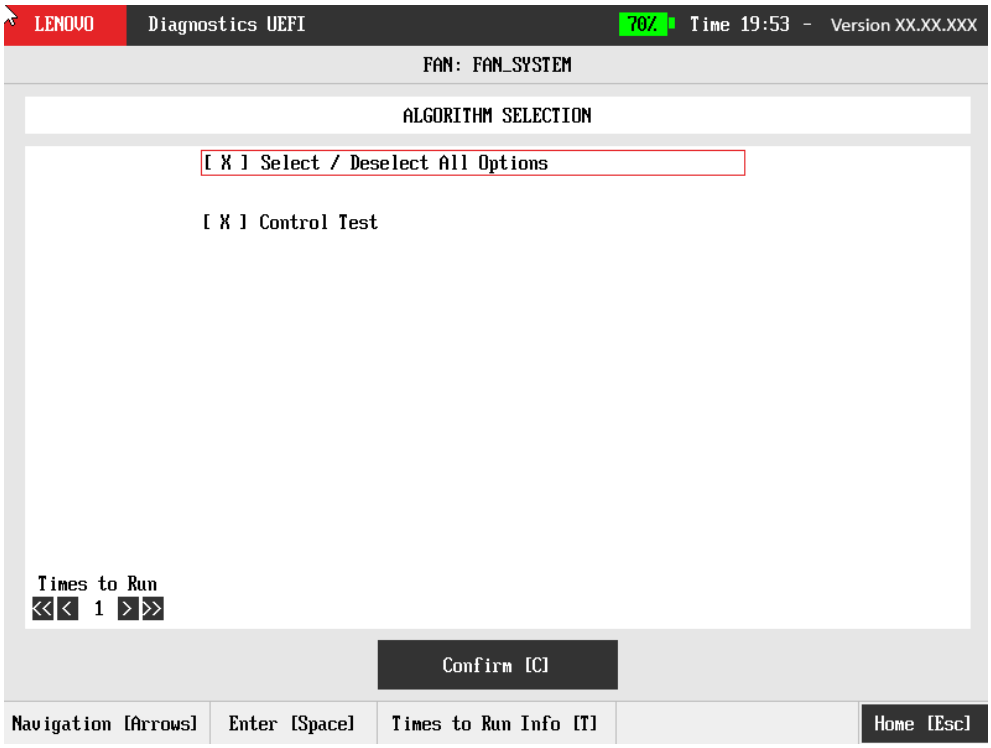

Figure 34: Fan algorithm seletion

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.

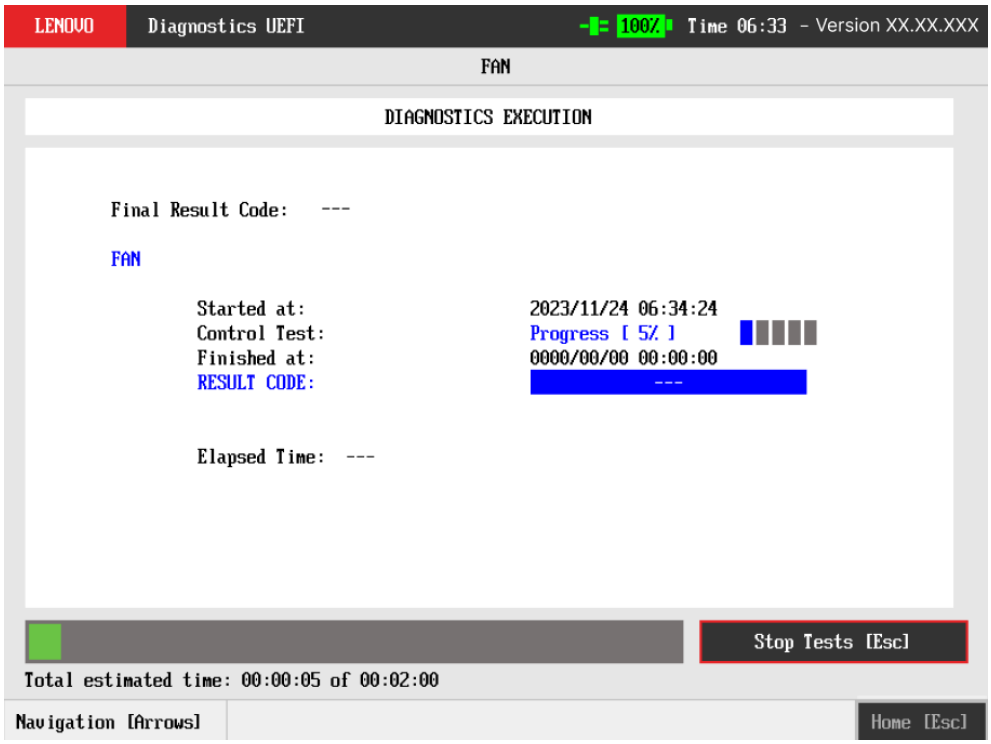

Figure 35: Fan diagnostics execution

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).

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 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.

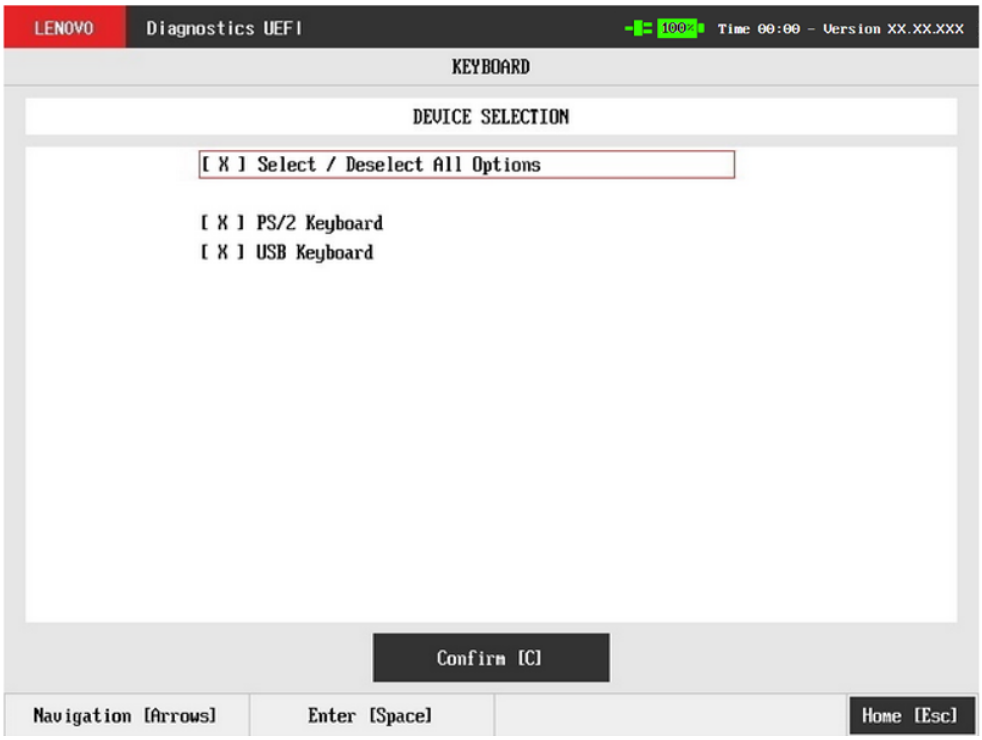

Figure 36: Keyboard type selection

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; WARNING[1]; 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.**

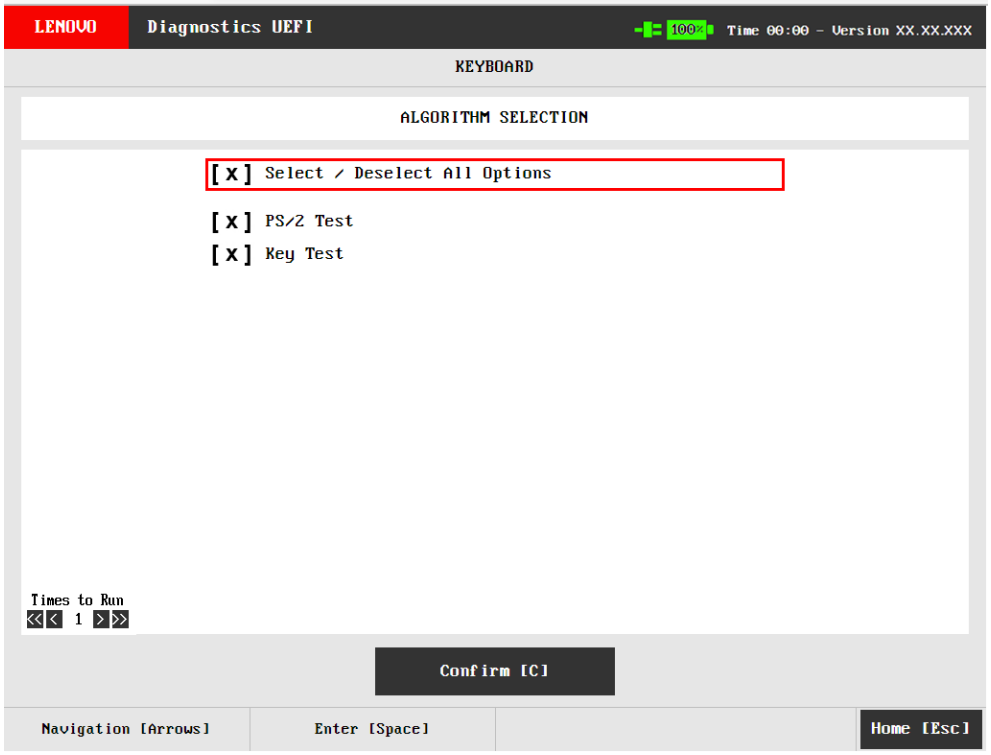

Figure 37: Keyboard algorithm selection

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

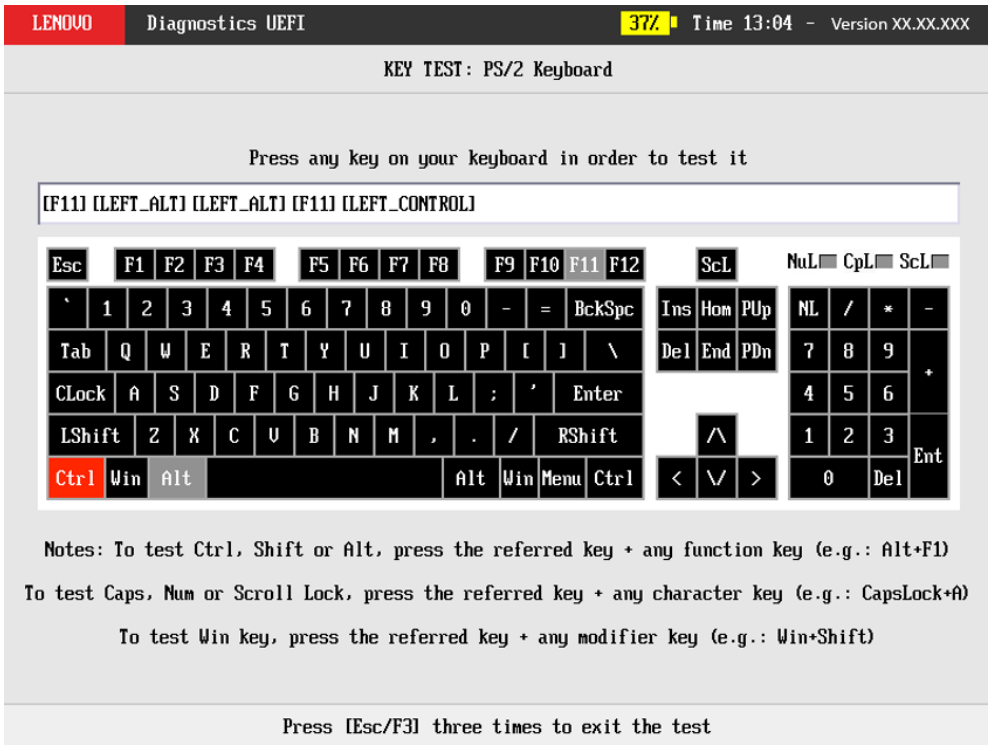

Figure 38: Keyboard key test execution

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.

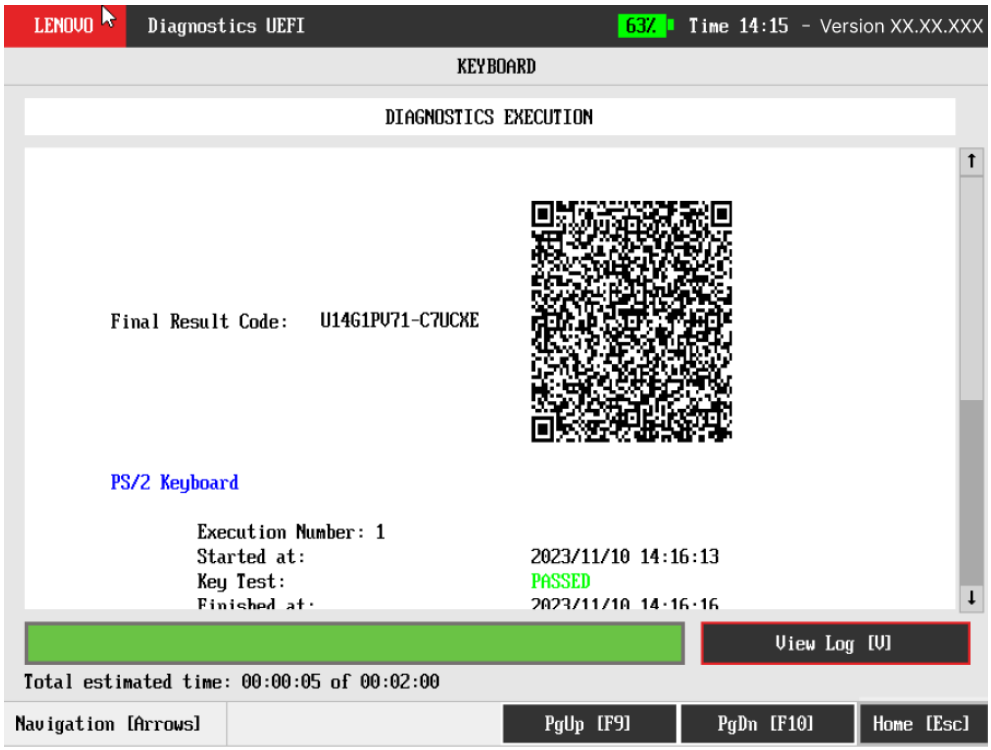

Figure 39: Keyboard diagnostics execution

Note

- 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.

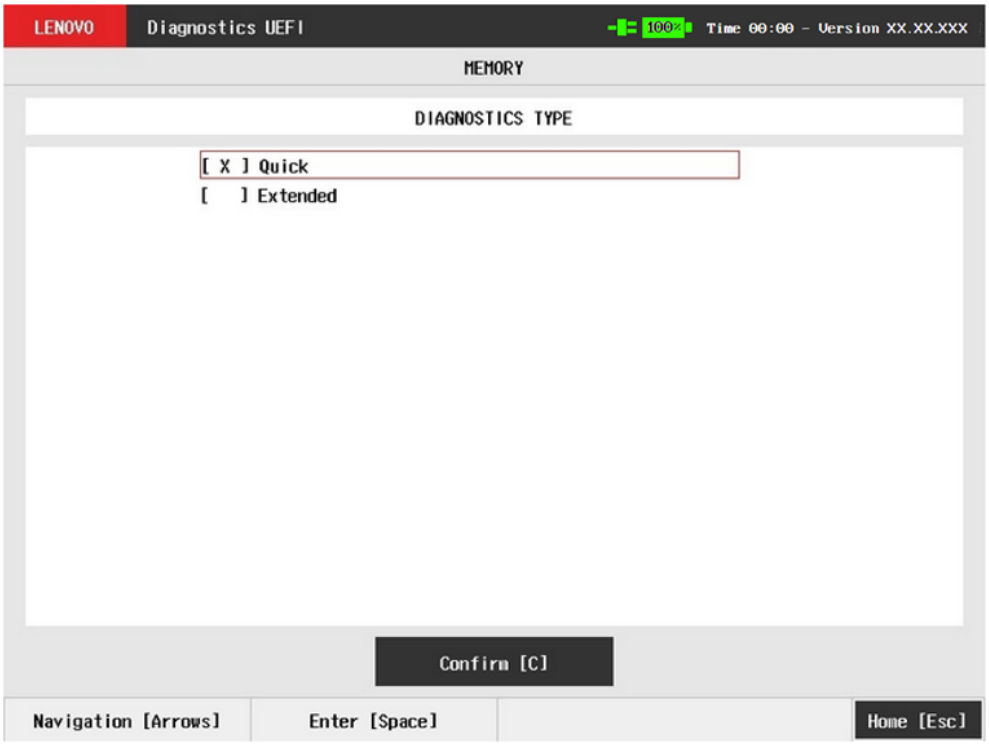

Figure 40: Memory diagnostic type

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:

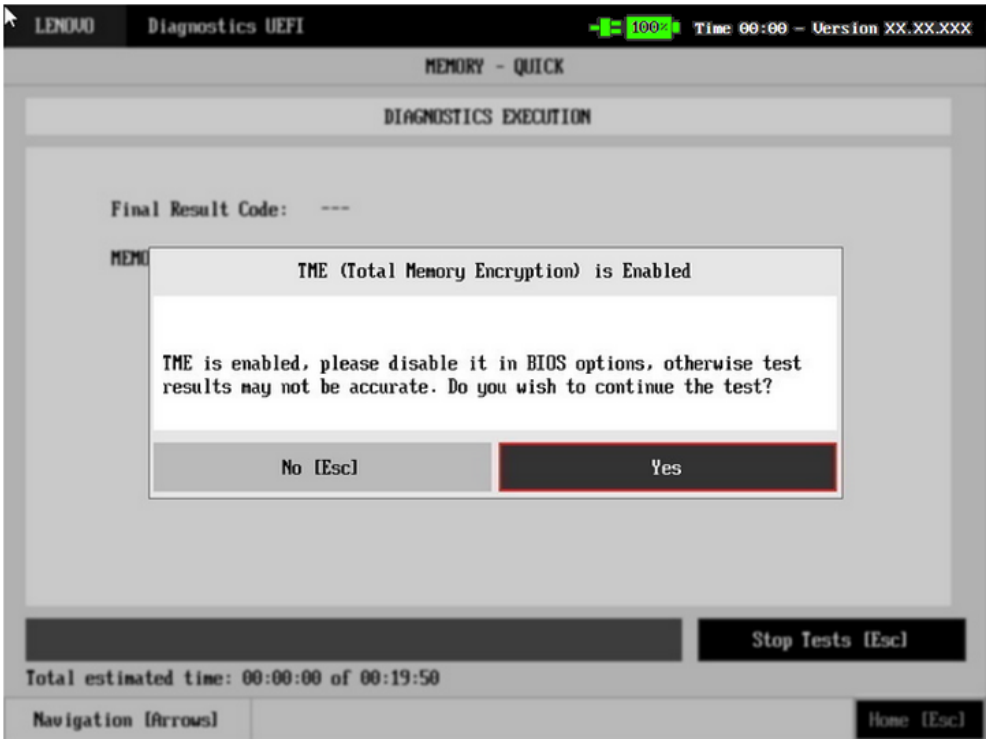

Figure 41: Memory diagnostic TME pop-up

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.

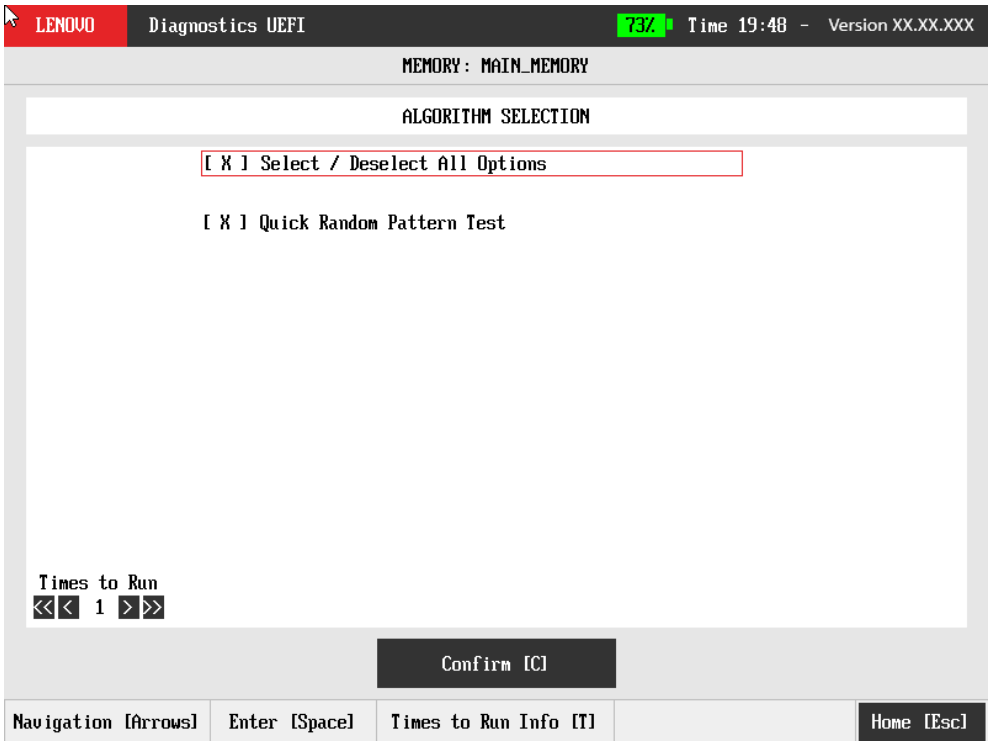

Figure 42: Memory quick diagnostics

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.

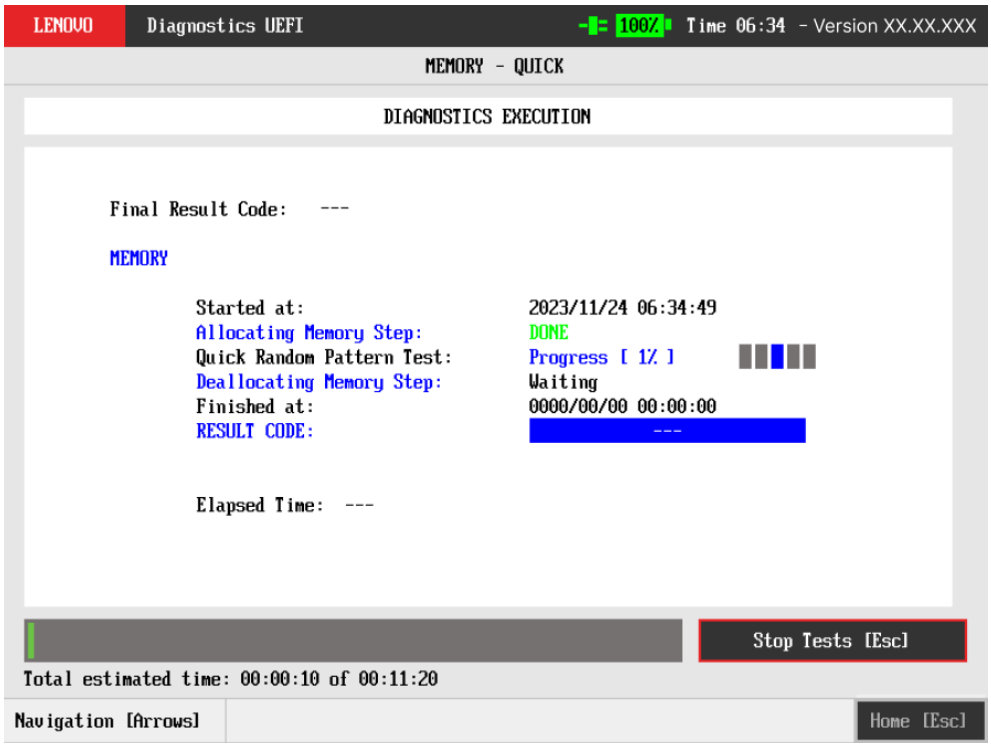

Figure 43: Memory quick diagnostics execution

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).

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).

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.

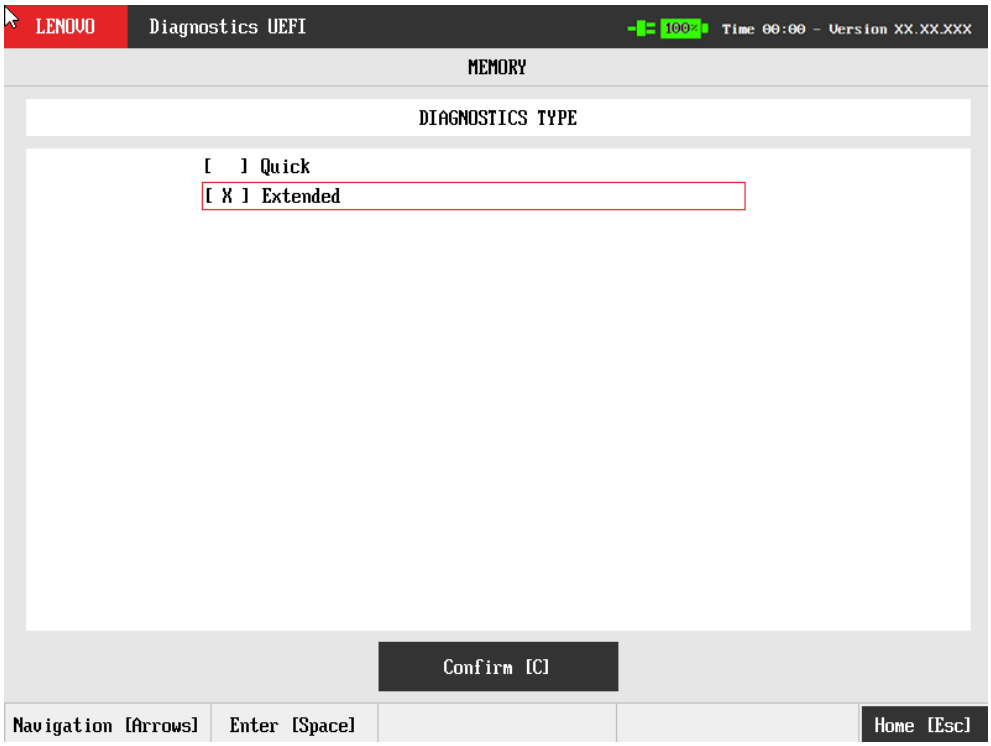

Figure 44: Memory extended diagnostics

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.

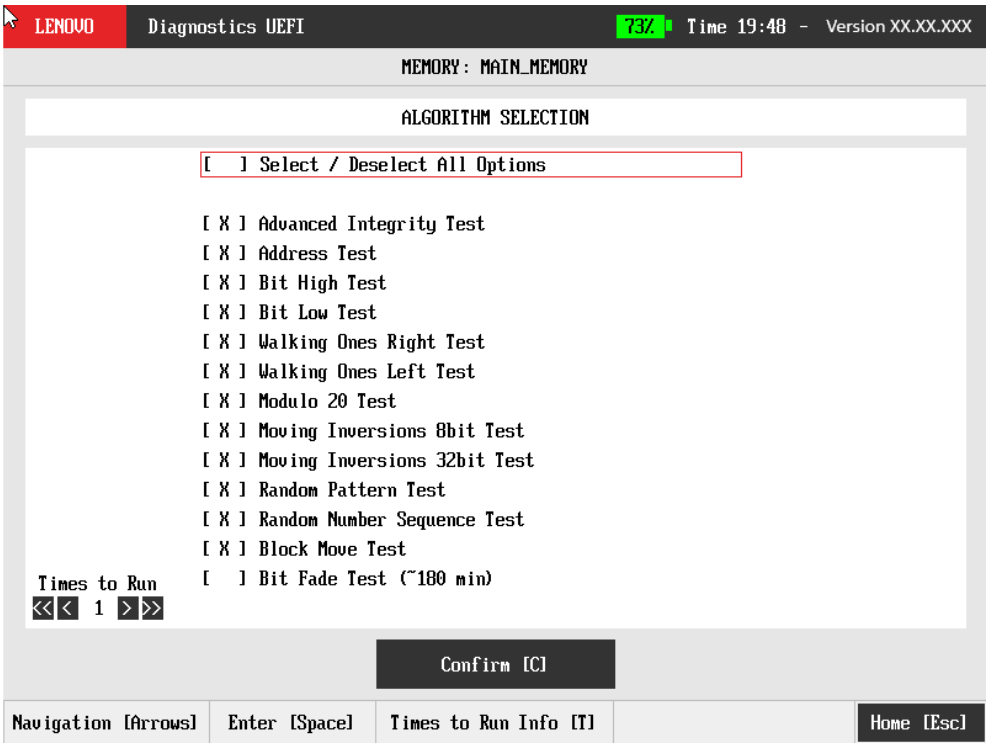

Figure 45: Memory extended algorithm selection

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.

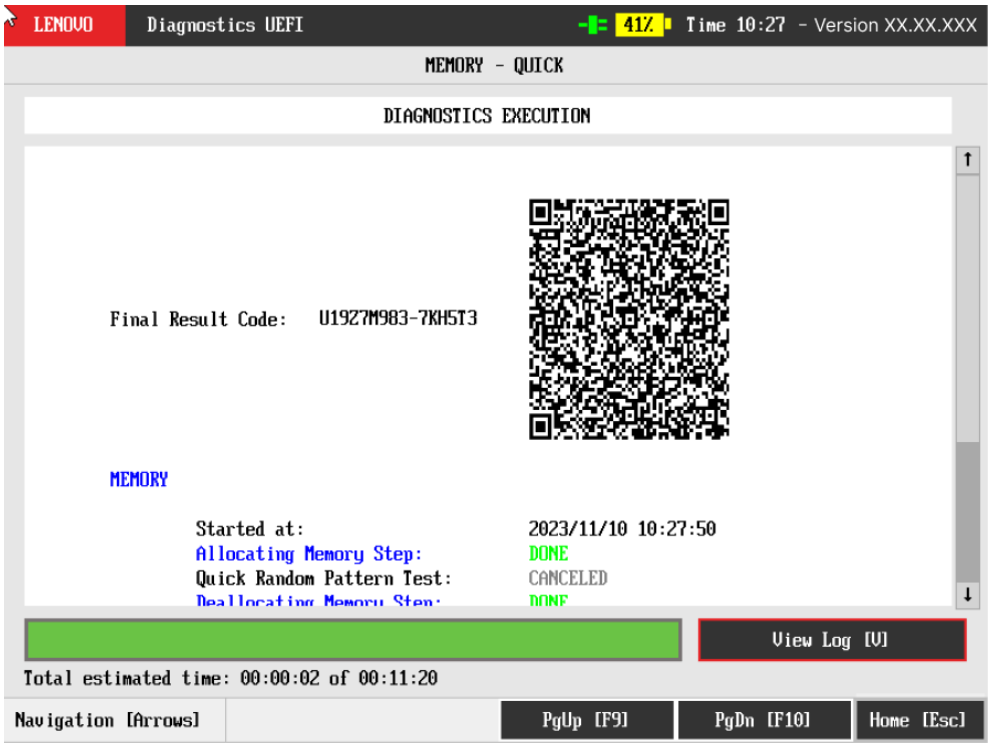

Figure 46: Memory extended algorithm execution

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).

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).

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 ERROR WROTE 0xFFFFFFFFFFFFFFFF, READ 0xFFFFFFFFFFFFEFFF
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 0x8000000000000000, READ 0x8000000000001000
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 MODULO_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 0x8080808080809080
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.

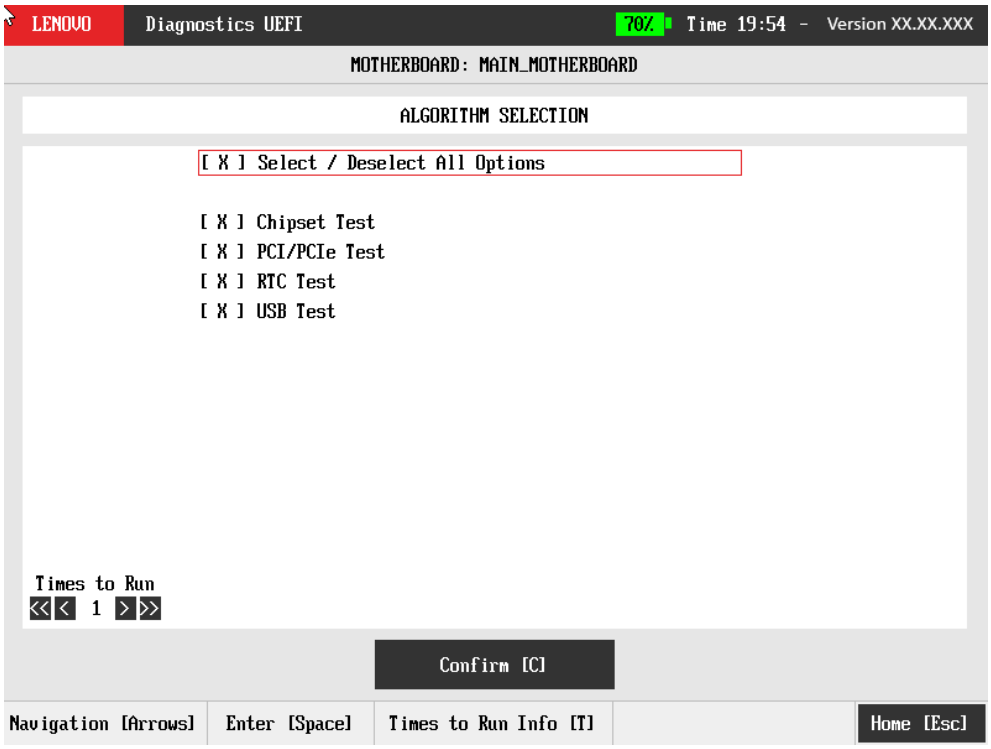

Figure 48: Motherboard algorithm selection

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.

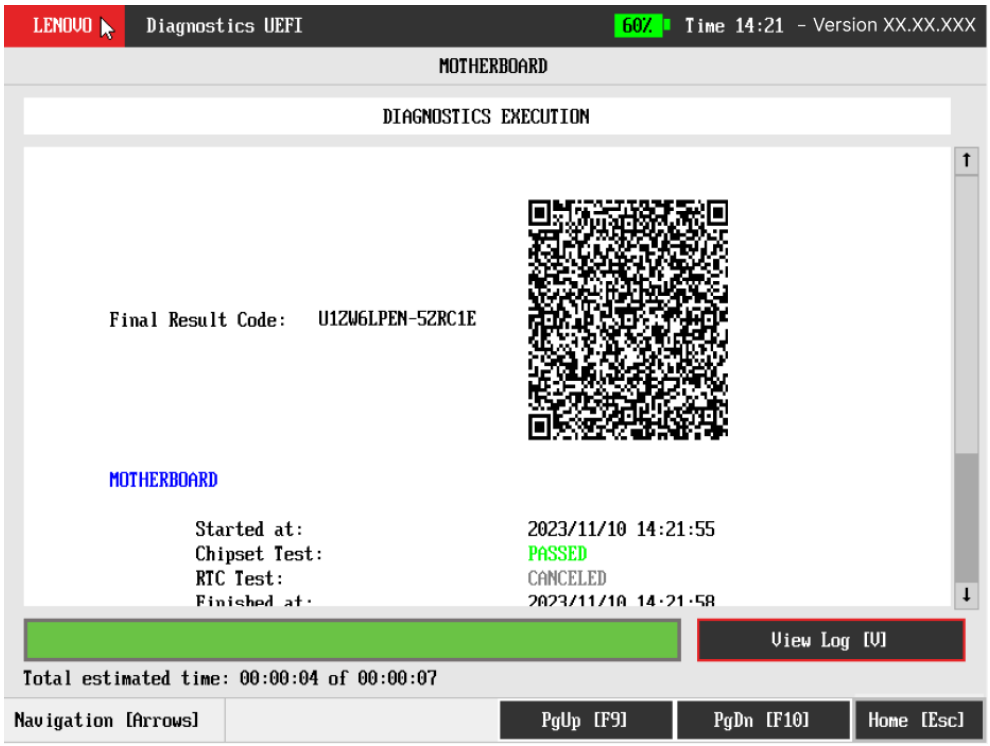

Figure 49: Motherboard diagnostics execution

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).

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).

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.

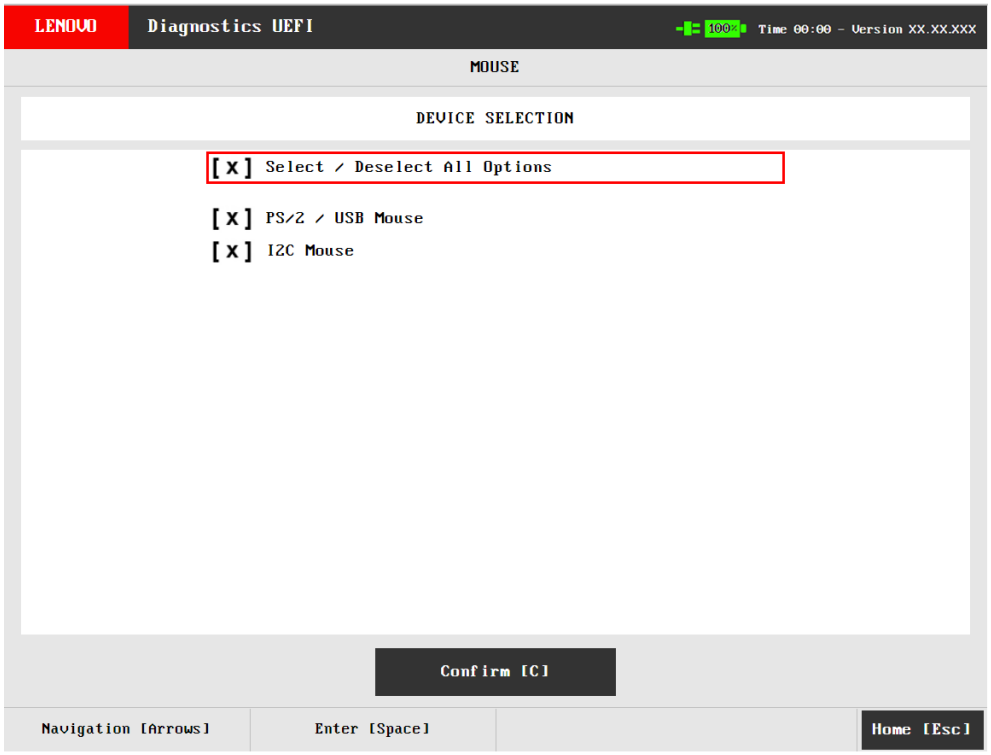

Figure 50: Mouse device selection

After the user device selection, the Algorithm Selection screen is displayed, as shown in the figure below.

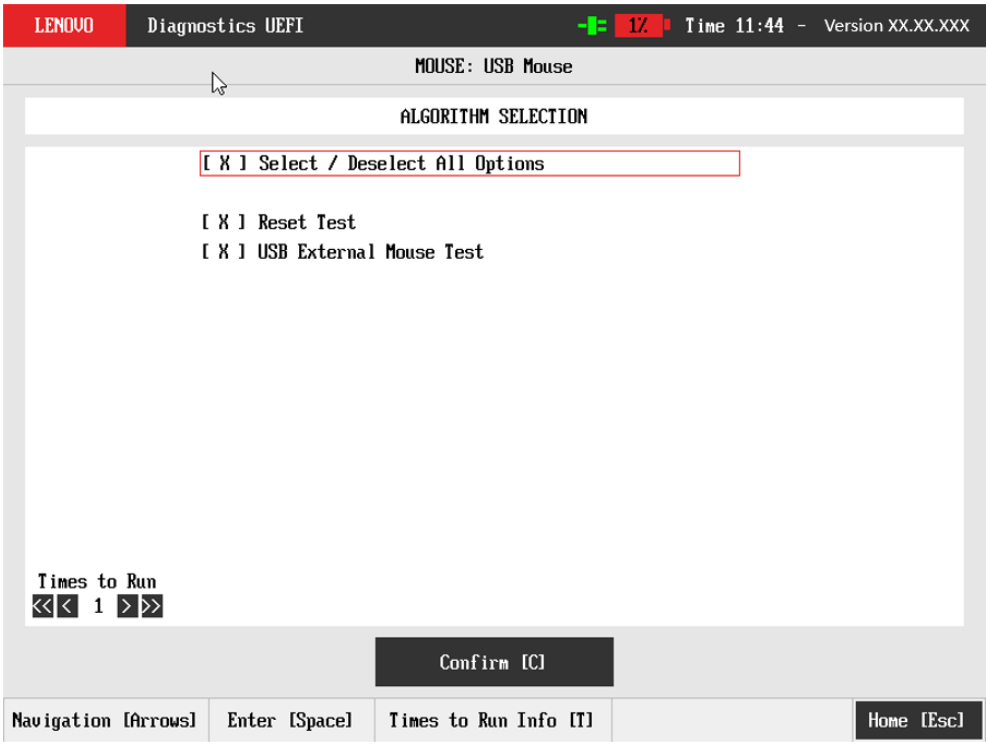

Figure 51: Mouse algorithm selection

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

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:

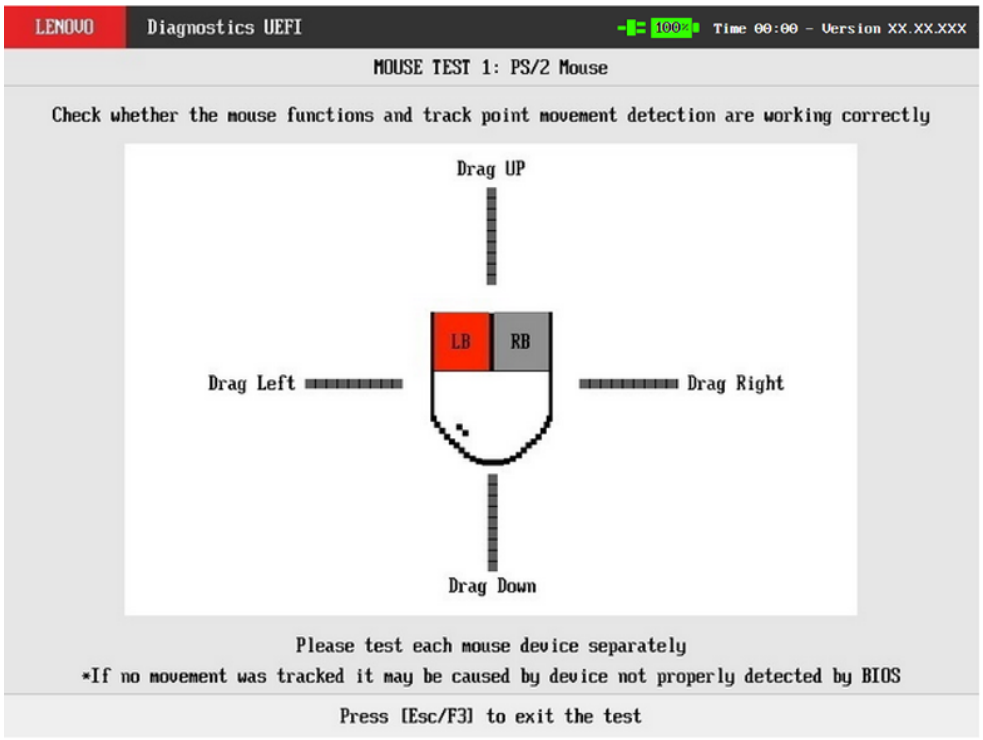

Figure 52: Mouse test execution PS/2

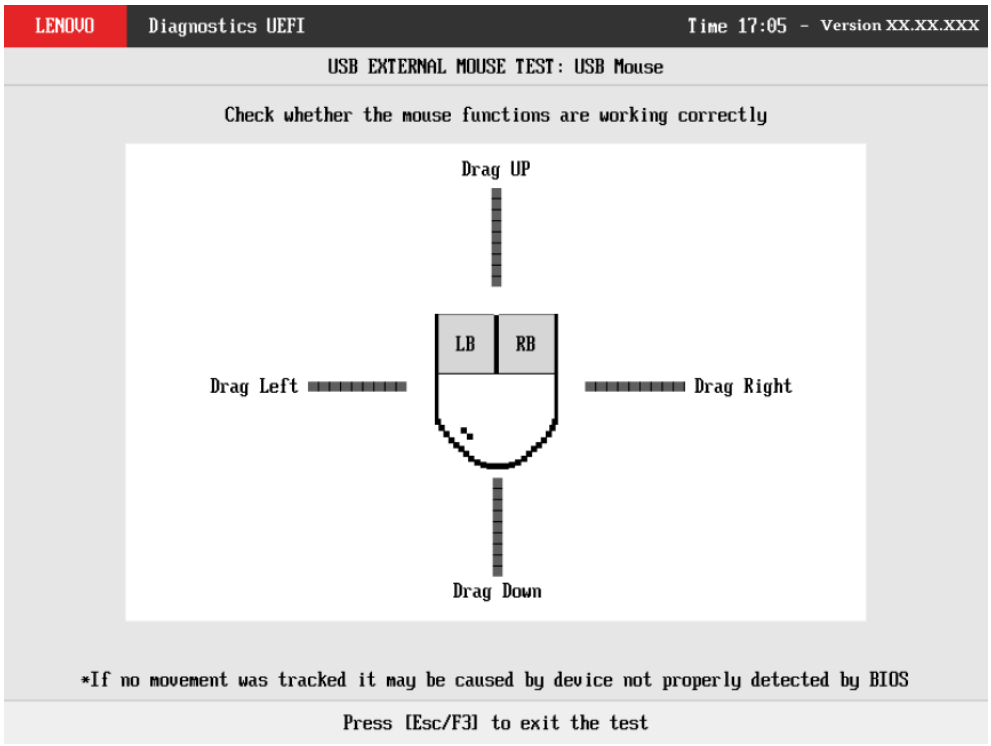

Figure 53: USB external mouse test

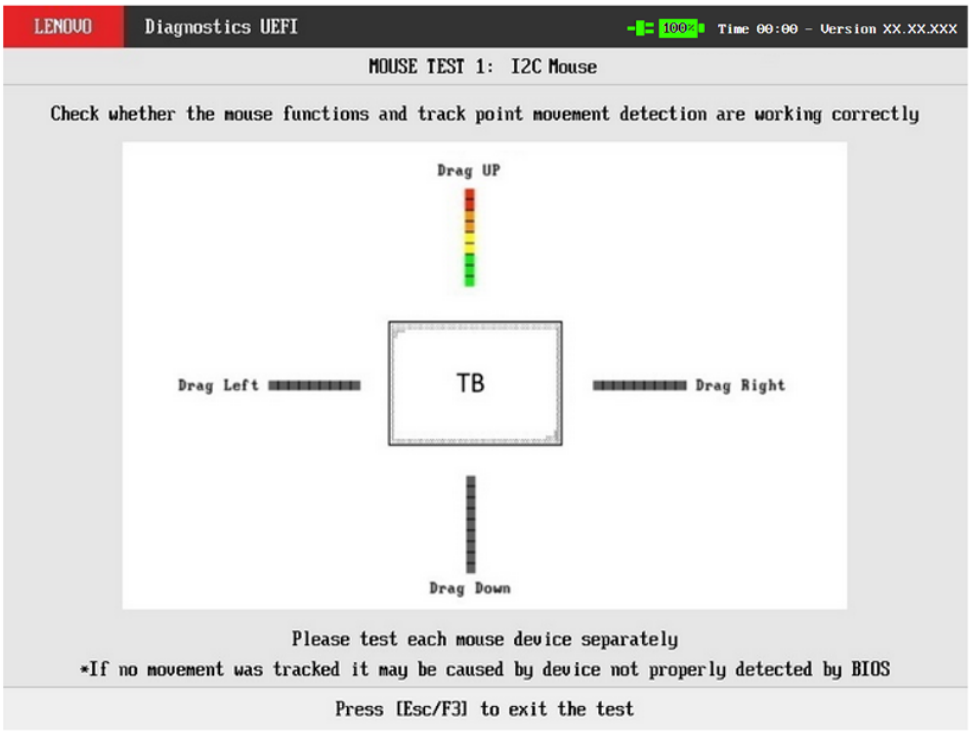

Figure 54: Mouse test execution I2C

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

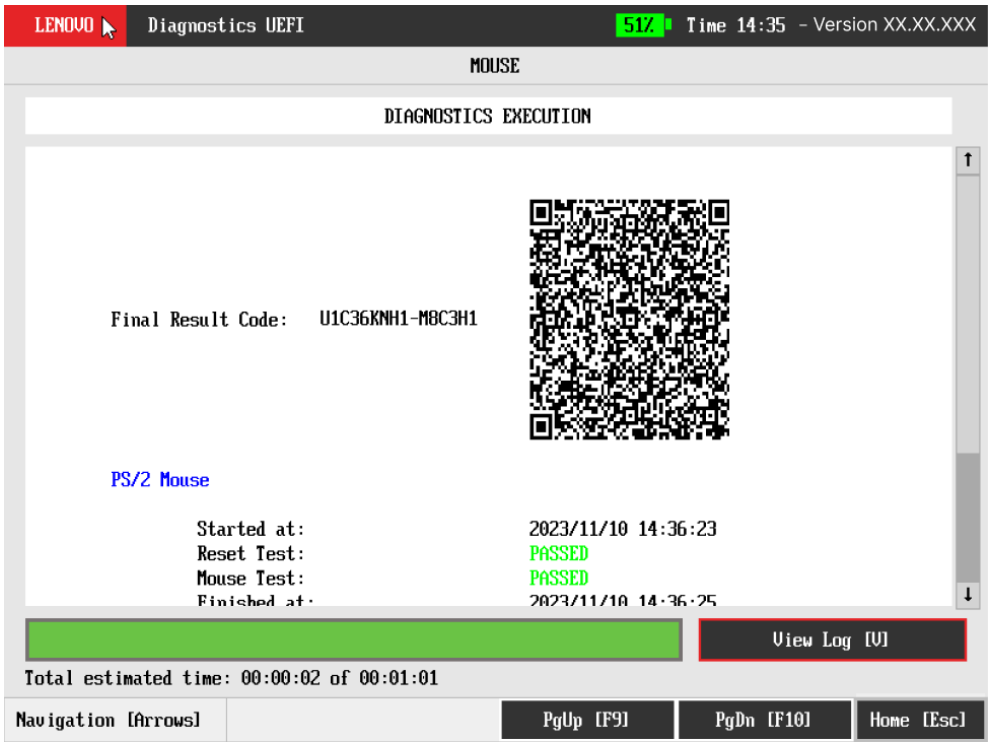

Figure 55: Mouse diagnostics execution

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.

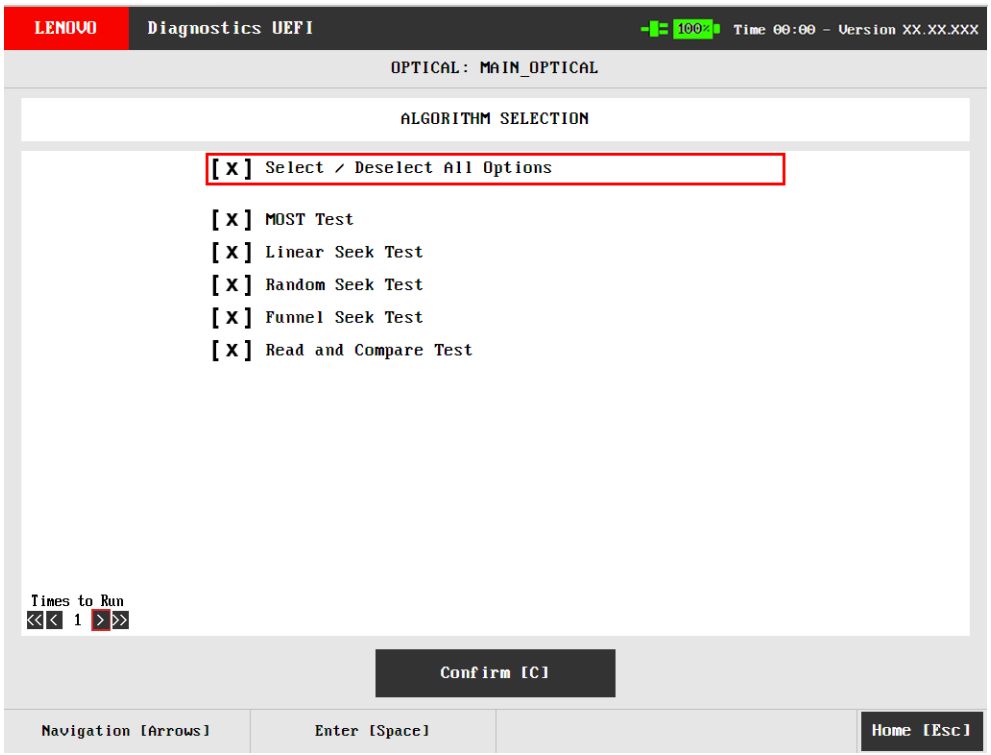

Figure 56: Optical algorithm selection

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 next figure.

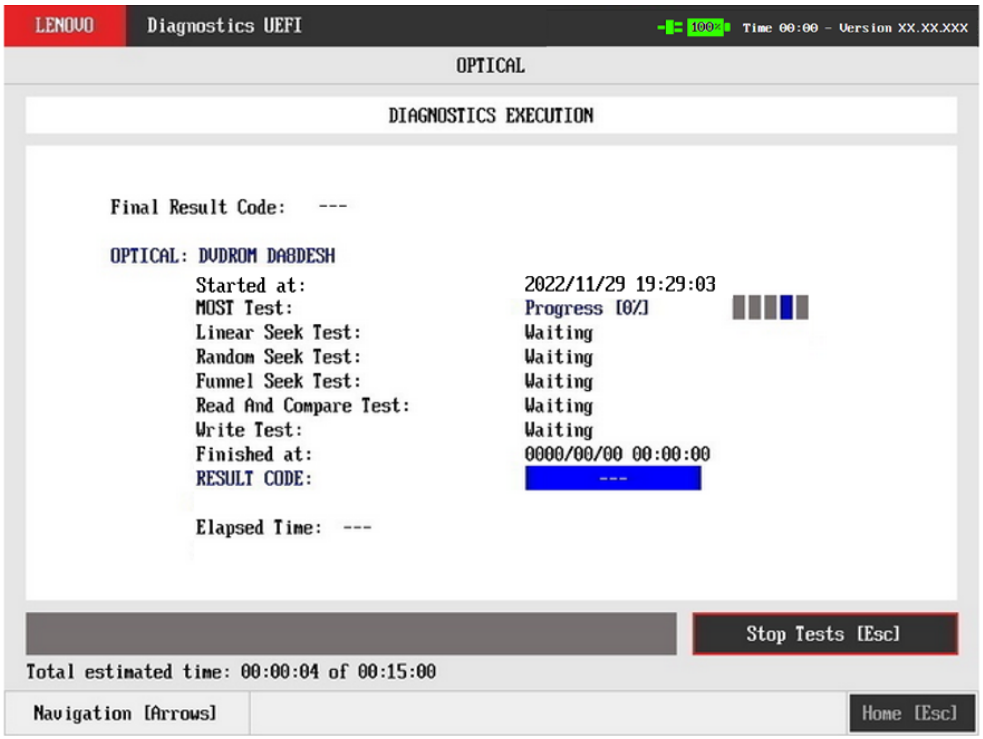

Figure 57: Optical diagnostics execution

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.

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.

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.

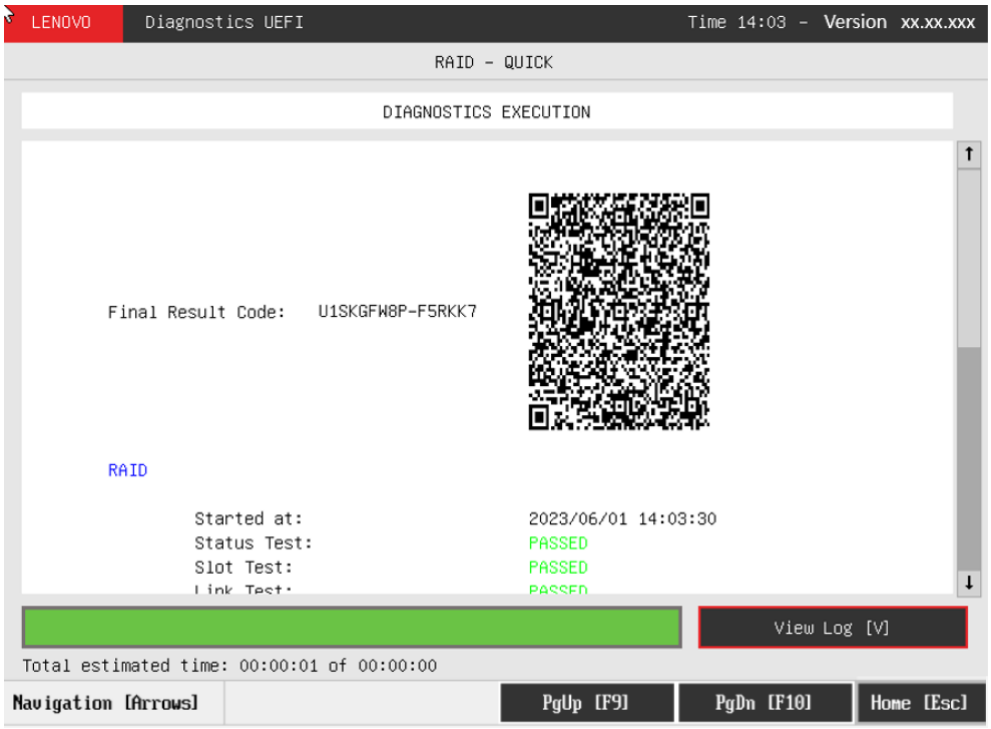

Figure 60: RAID quick diagnstics execution

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.

Figure 61: RAID 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

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.

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.

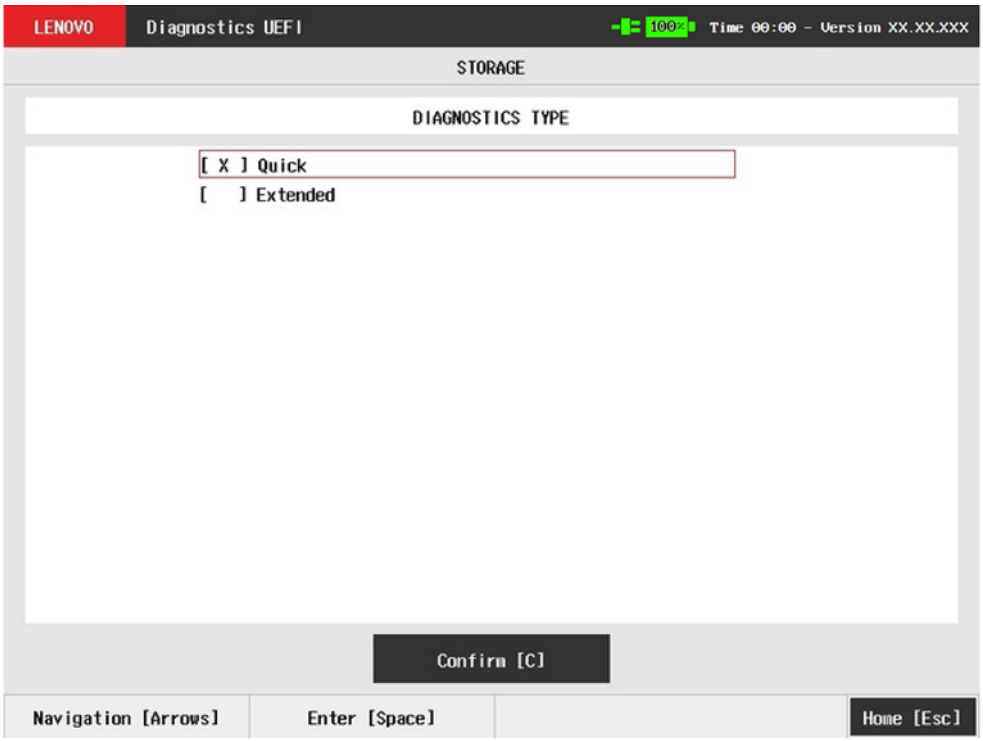

Figure 63: Storage diagnostics type

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.

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.)

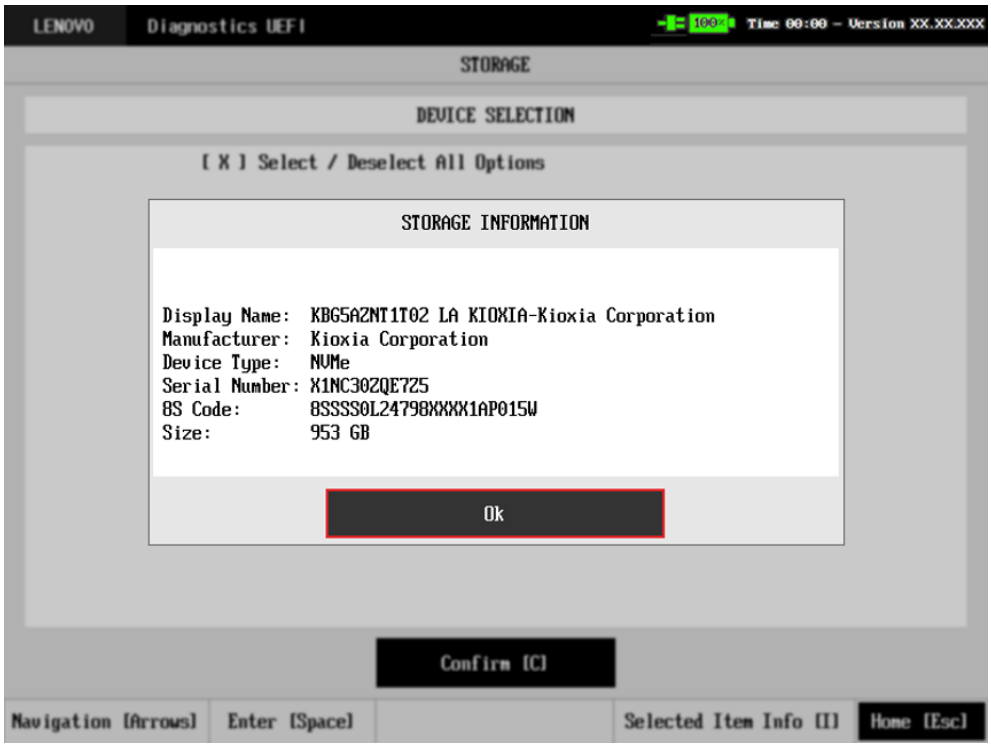

Figure 65: Storage device information pop-up

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.

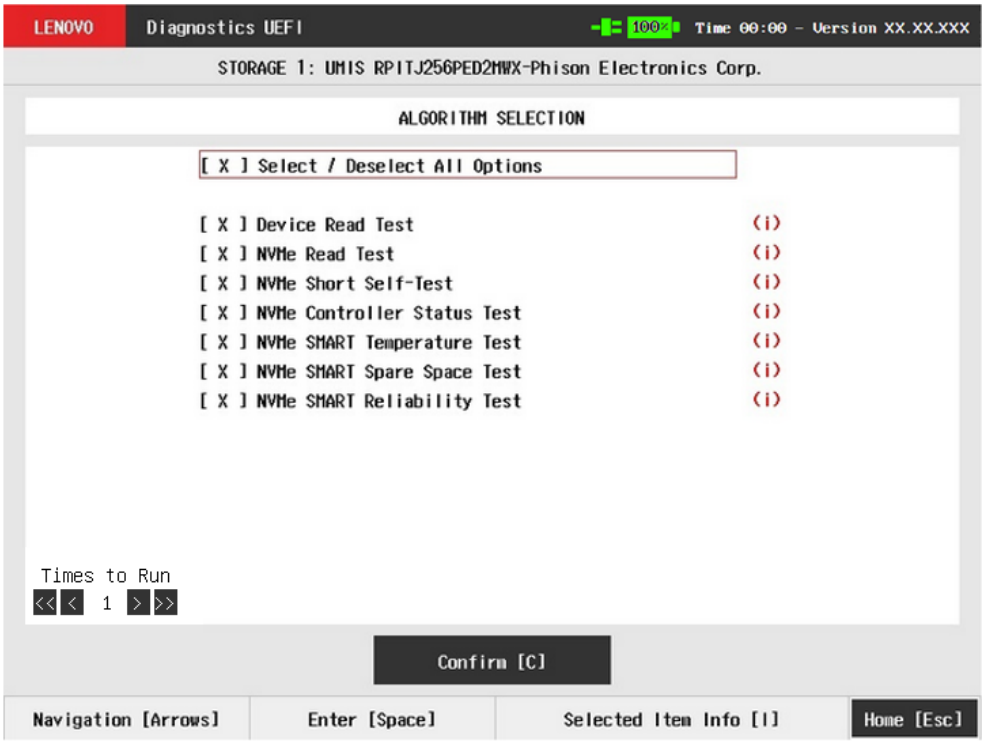

Figure 66: Storage quick algorithm selection for NVMe devices

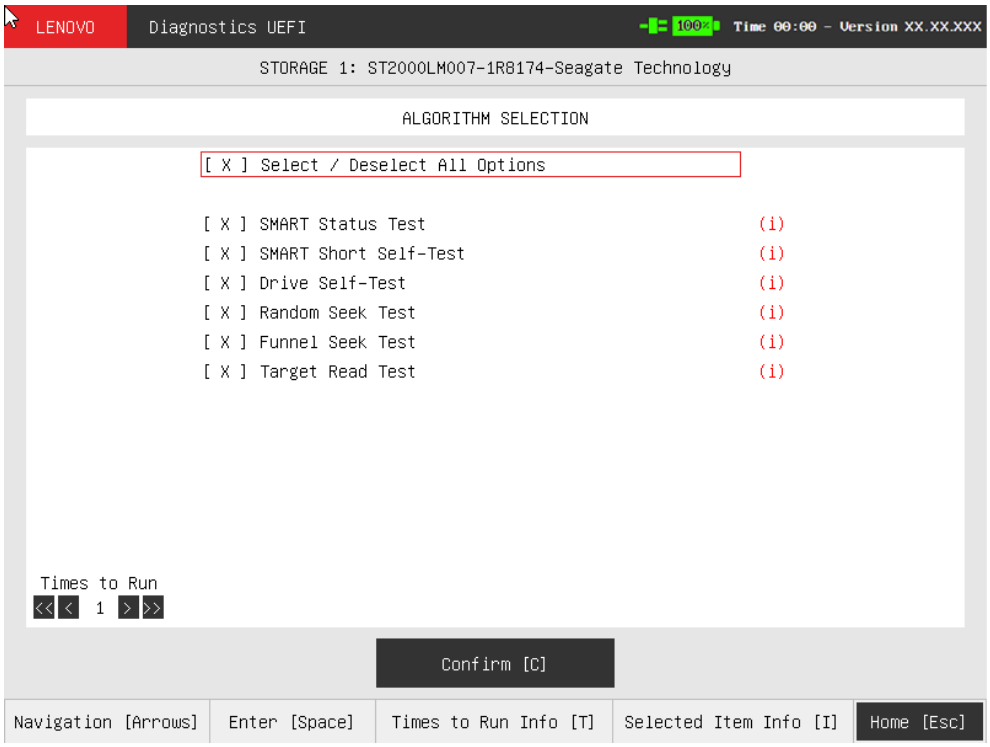

Figure 67: Storage quick algorithm selection for HDD devices

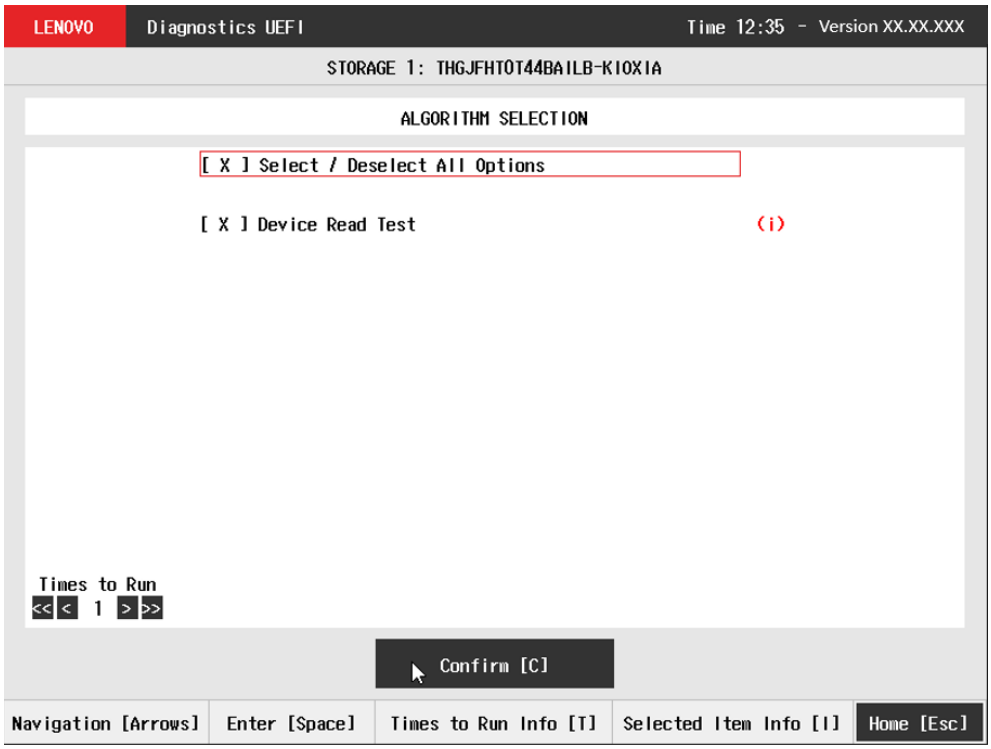

Figure 68: Storage quick algorithm selection for UFS devices

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 tested, the user can use the "Confirm" button. It will start the diagnostic, as demonstrated in the next figure.

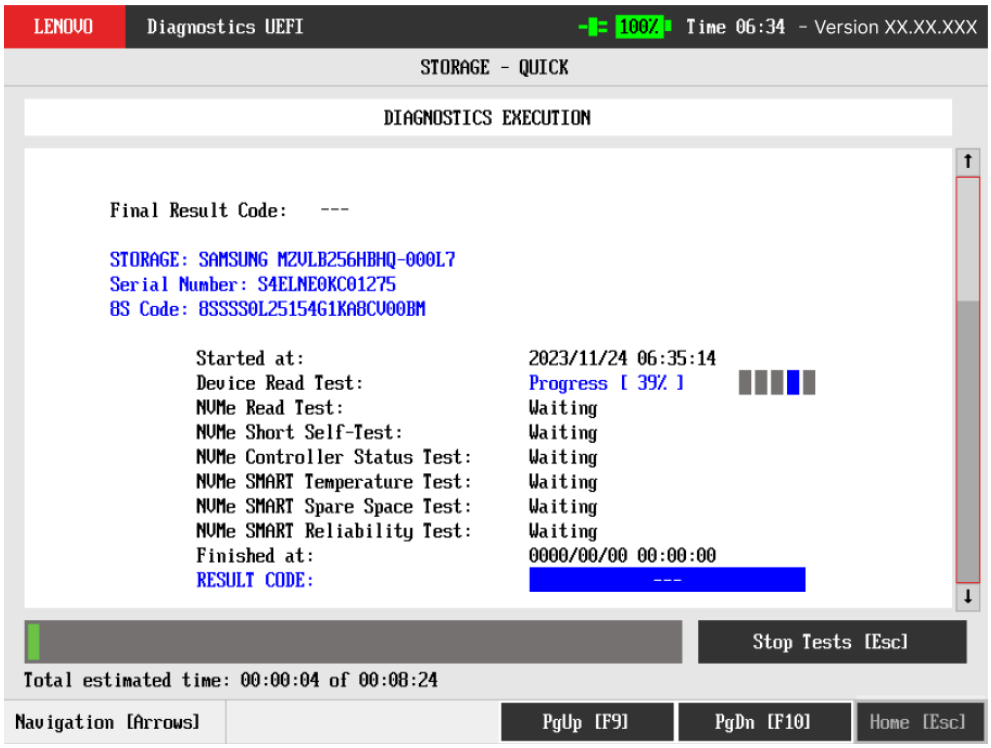

Figure 69: Storage quick diagnostics execution for NVMe devices

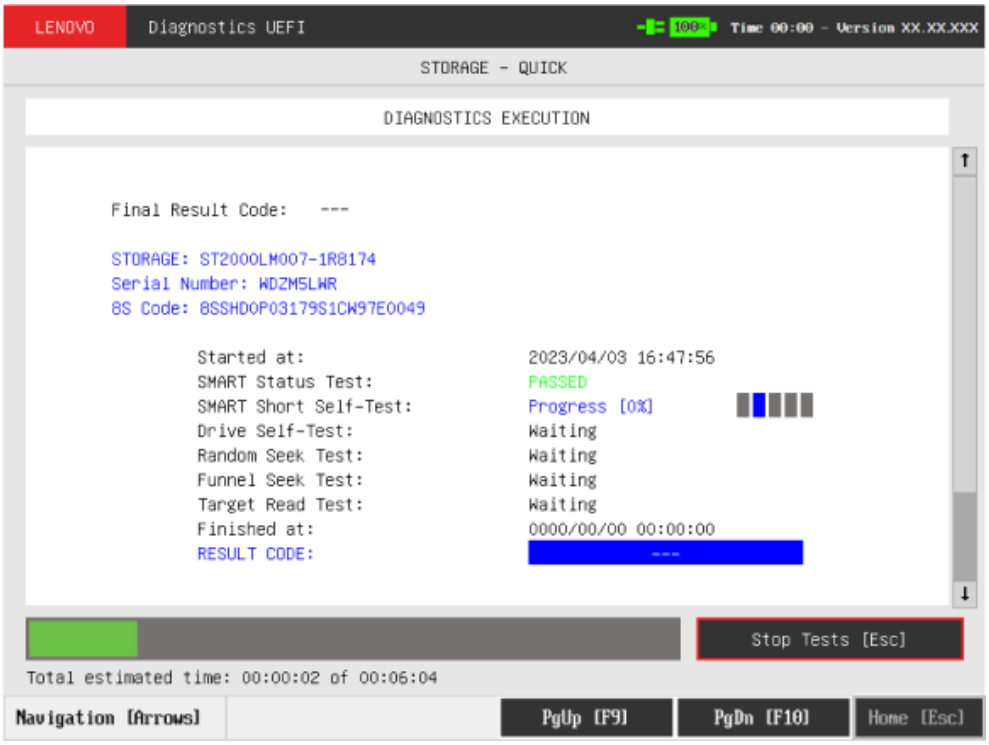

Figure 70: Storage quick diagnostics execution for HDD devices

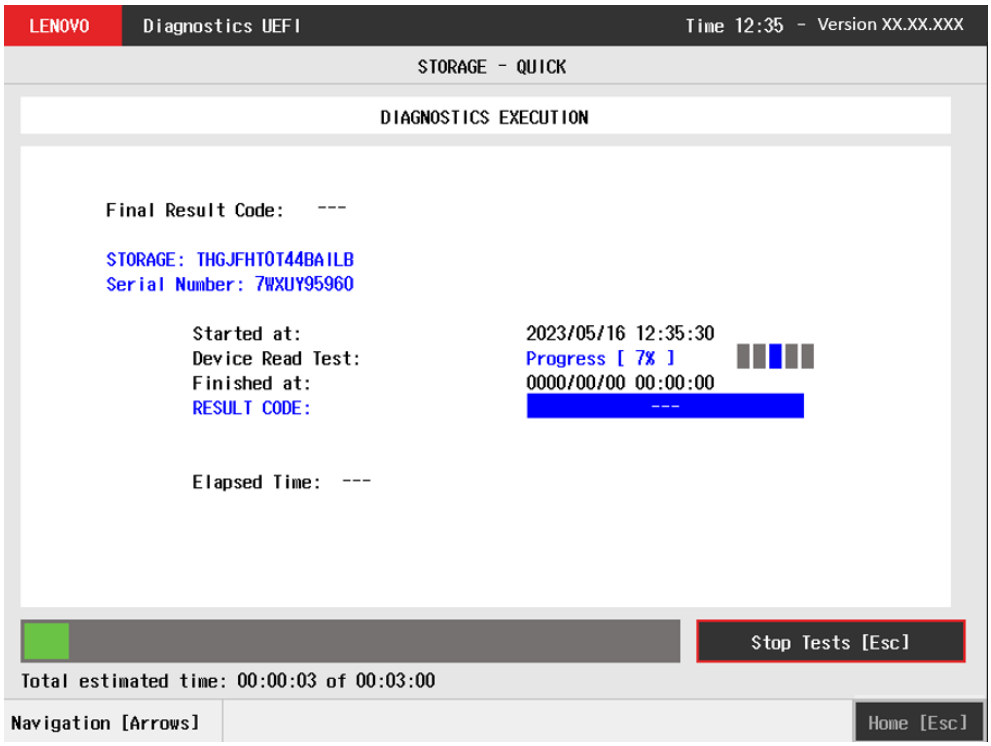

Figure 71: Storage quick diagnostics execution for UFS devices

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.

Figure 72: Storage extended algorithm selection for NVMe devices

Figure 73: Storage extended algorithm selection for HDD devices

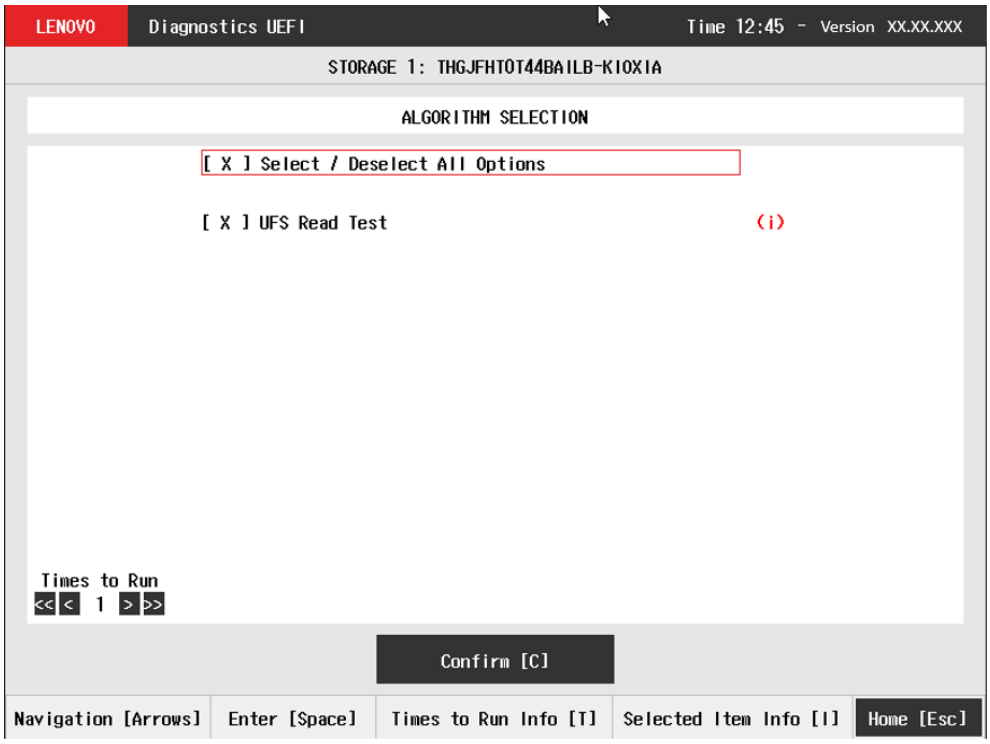

Figure 74: Storage extended algorithm selection for UFS devices

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 tested, the user can use the "Confirm" button. It will start the diagnostic, as demonstrated in the next figure.

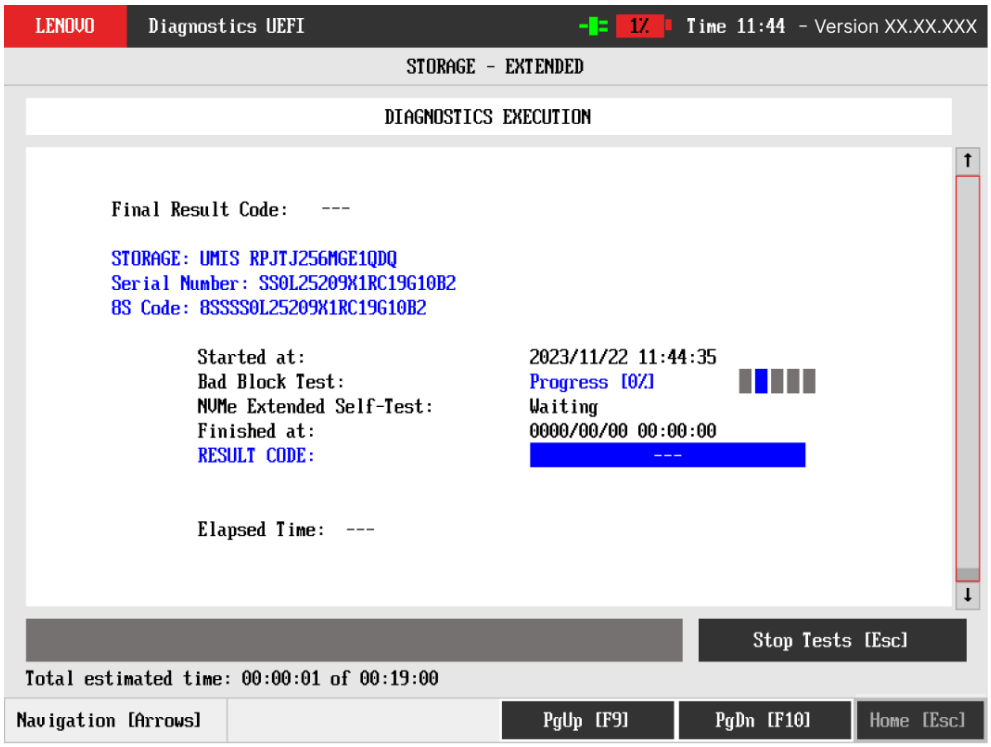

Figure 75: Storage extended dignostics execution for NVMe devices

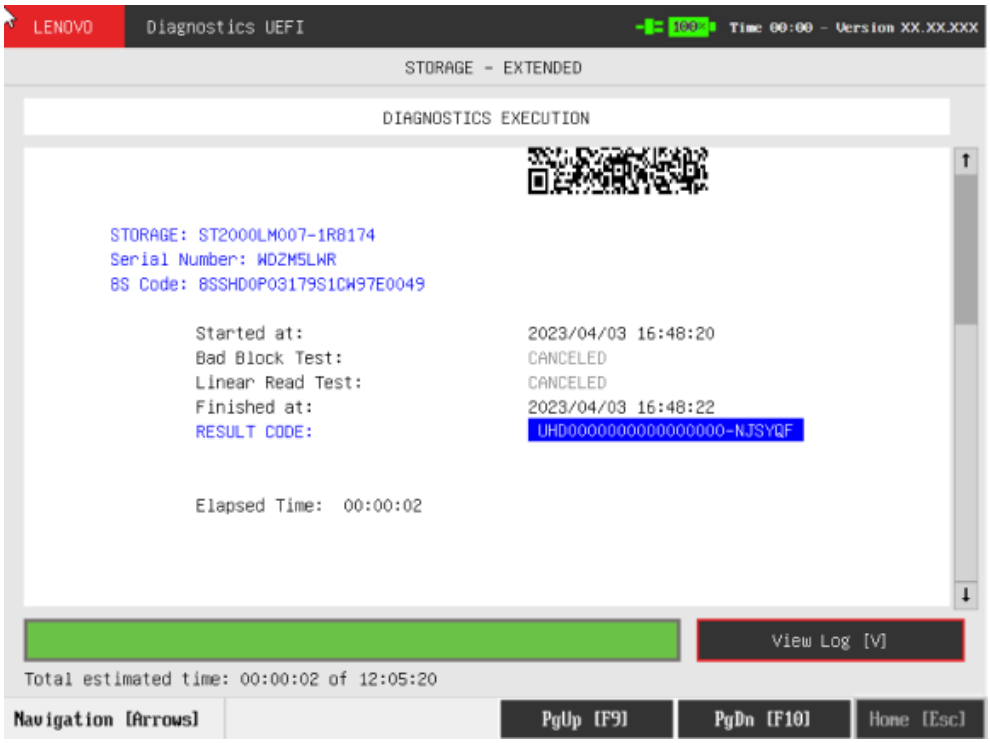

Figure 76: Storage extended dignostics execution for HDD devices

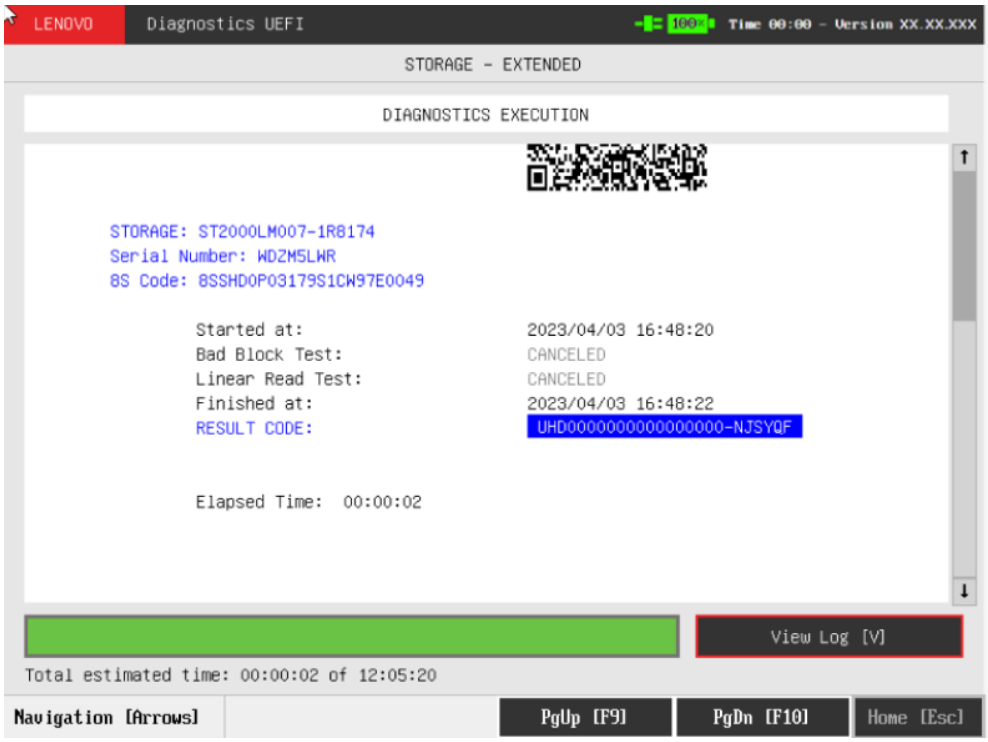

Figure 77: Storage extended dignostics execution for UFS devices

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:

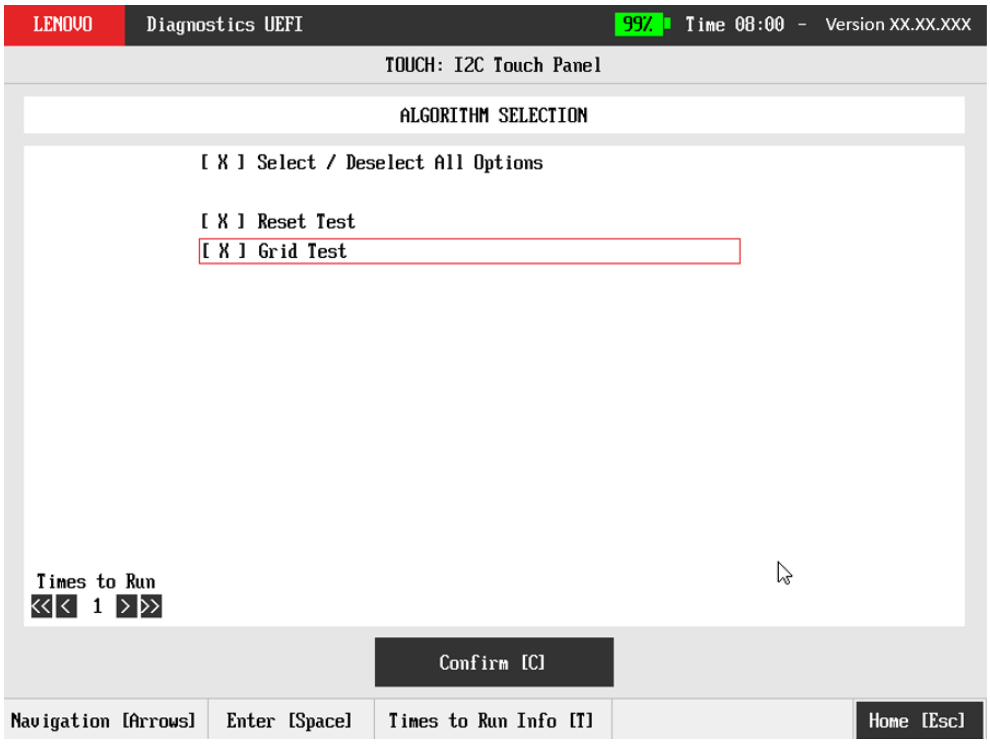

Figure 78: Touch algorithm selection

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

- **Reset Test:**
  - **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.

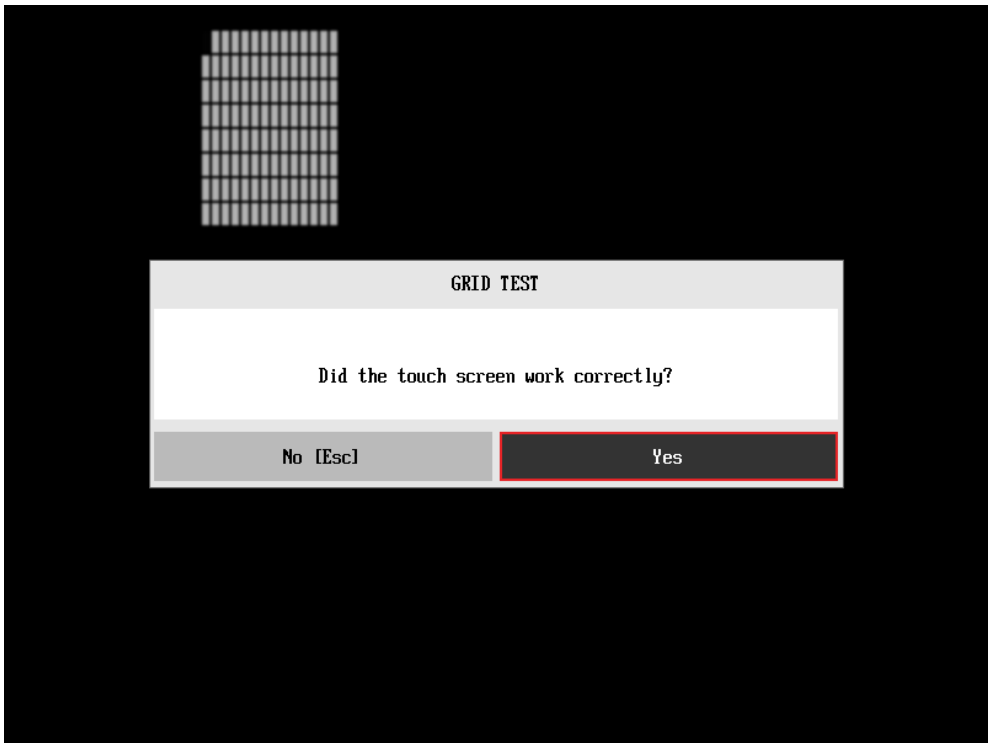

Figure 80: Grid test ending pop-up

After the confirmation, it will start the diagnostic, as demonstrated in the next figure.

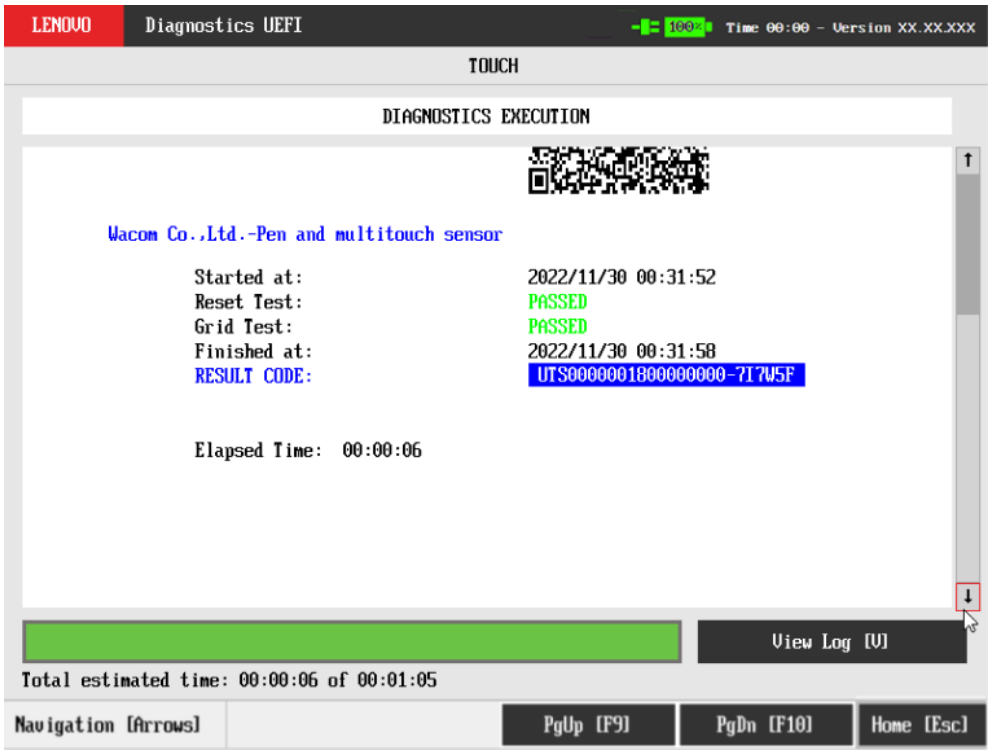

Figure 81: Touch diagnostics execution

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.

Figure 82: Wired ethernet device selection

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

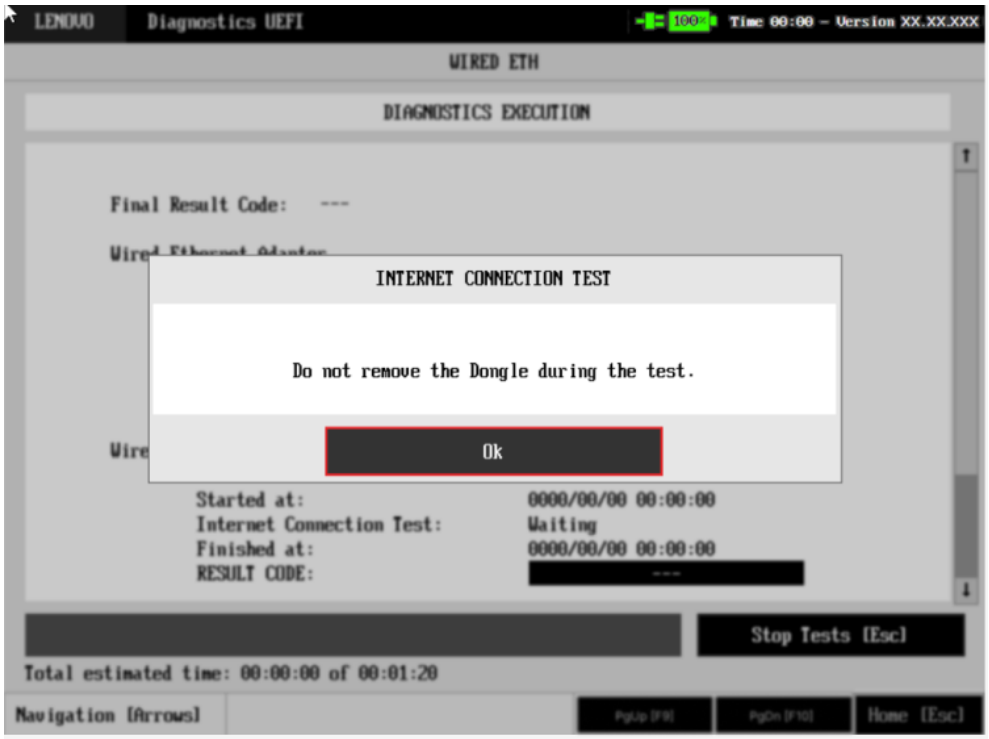

Figure 83: Internet connection test's dongle warning

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.

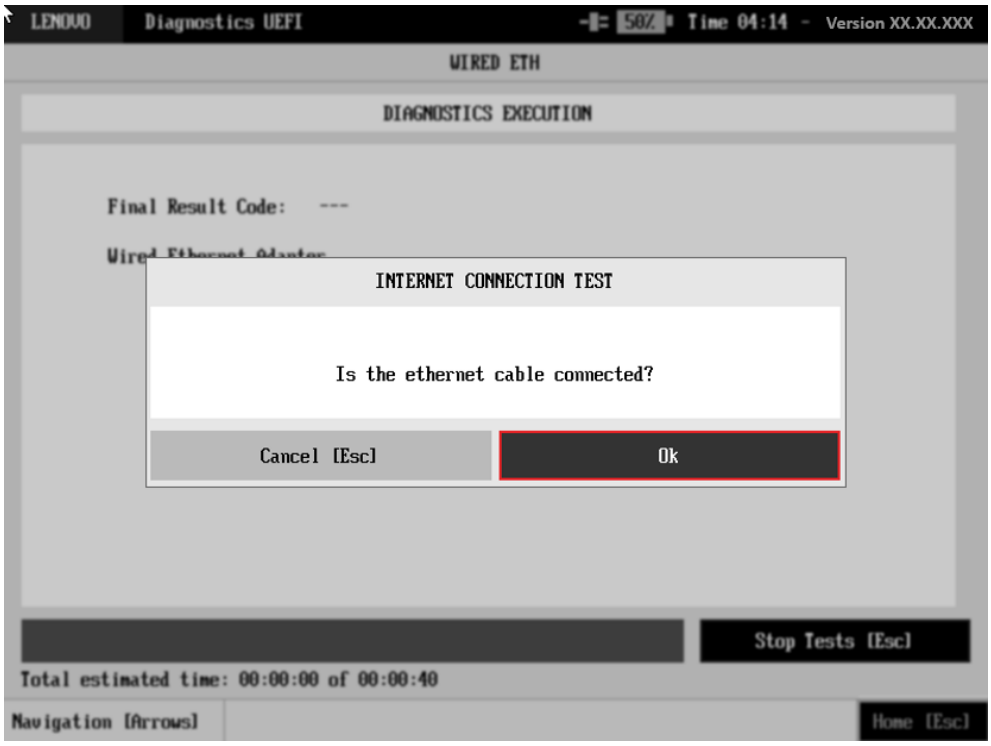

Figure 85: Internet connection test's pop-up

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.

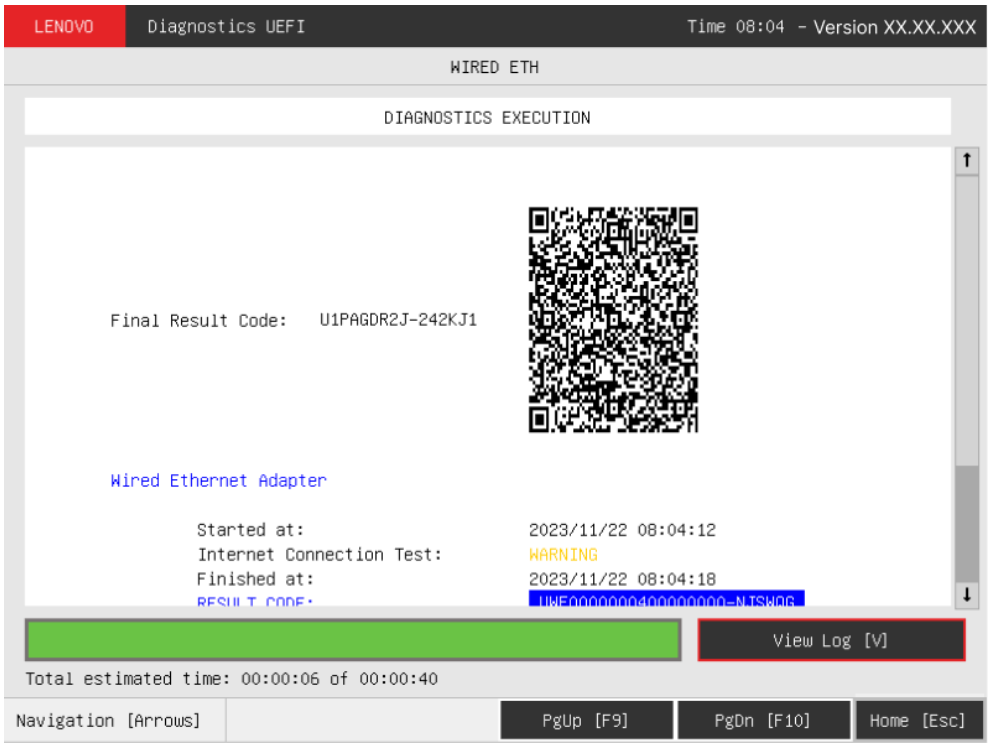

Figure 86: Wired ethernet diagnostics execution

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:

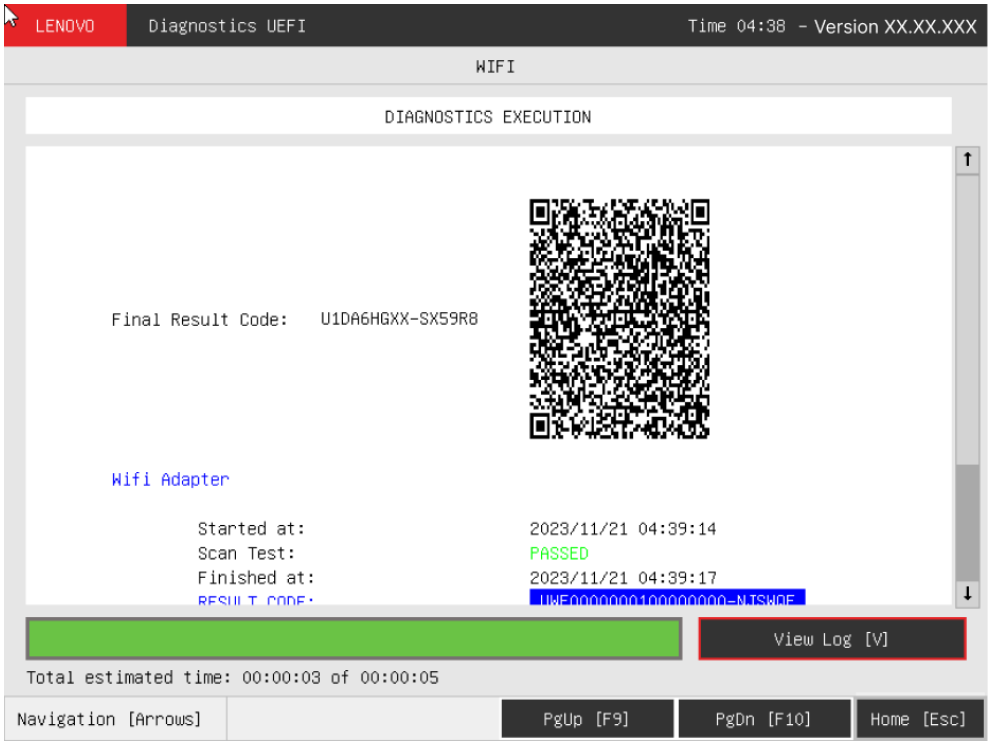

Figure 87: WiFi diagnostics execution

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.

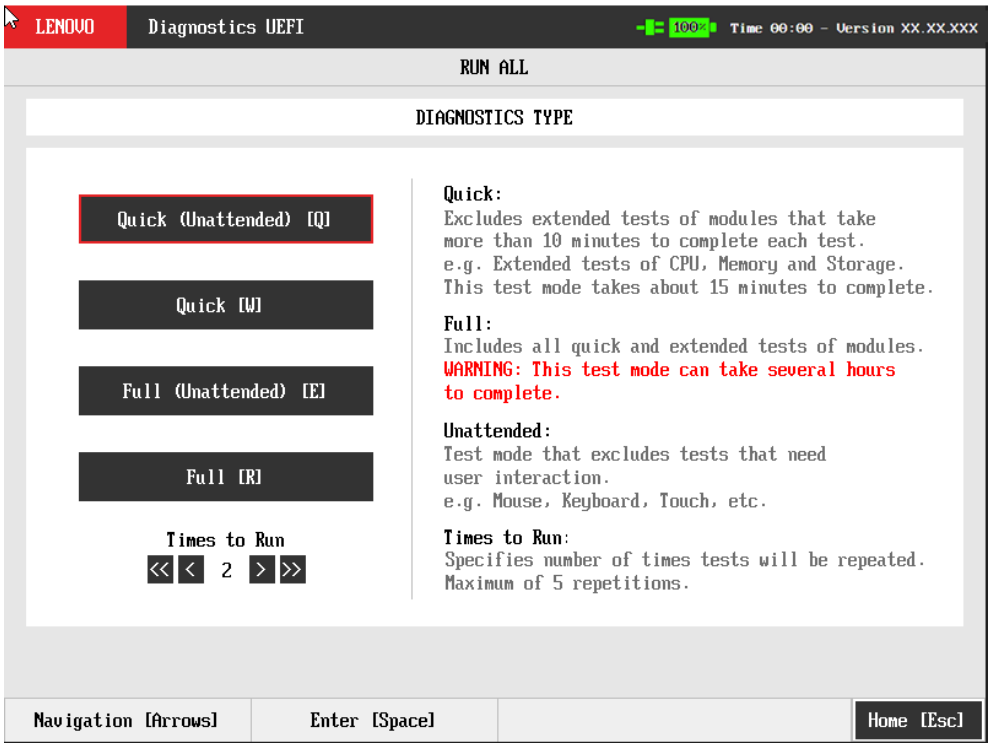

Figure 88: Run All diagnostic type

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.

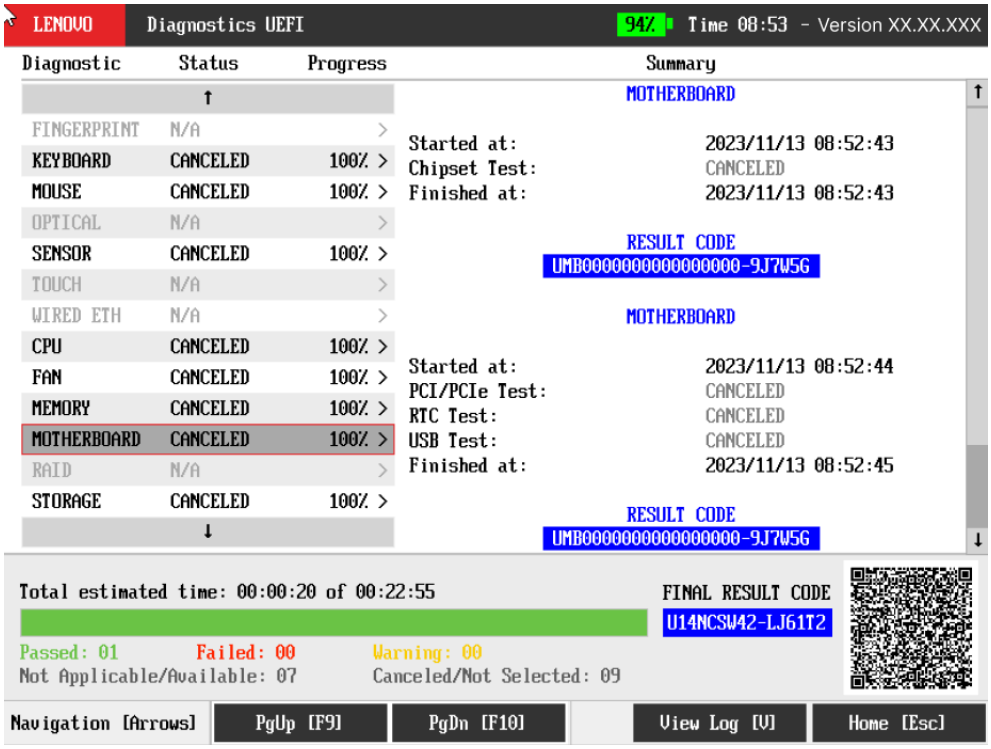

Figure 89: Run All diagnostics execution

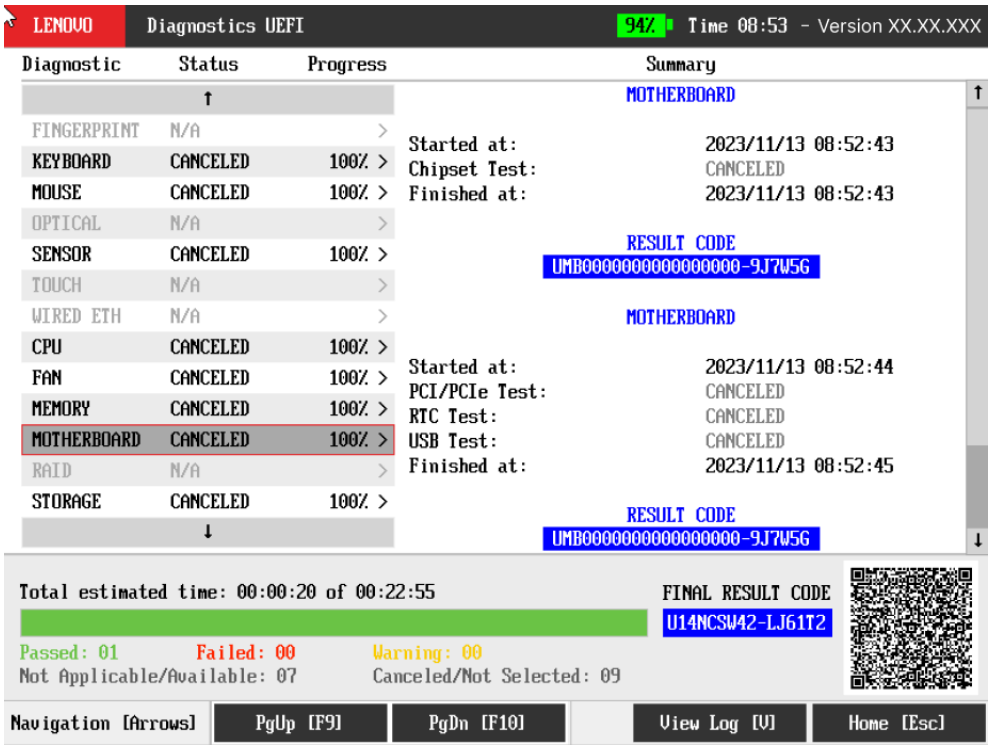

Figure 90: Run All diagnostics execution

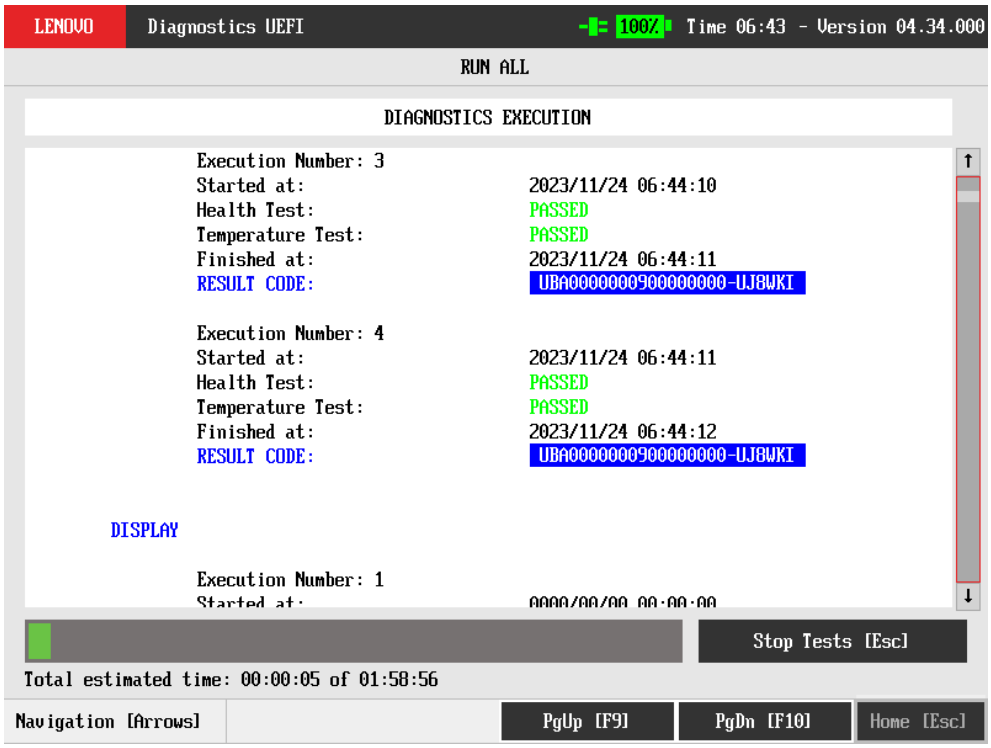

Figure 91: Run All diagnostics execution - multiple iterations

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.

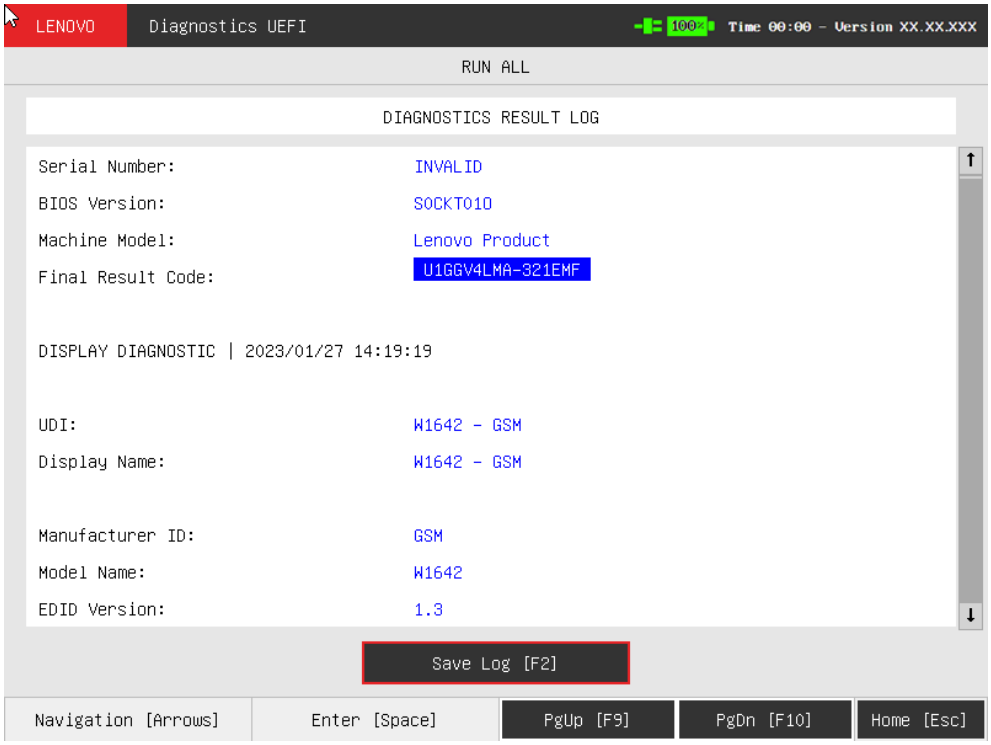

Figure 92: Run All diagnostics result log

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.

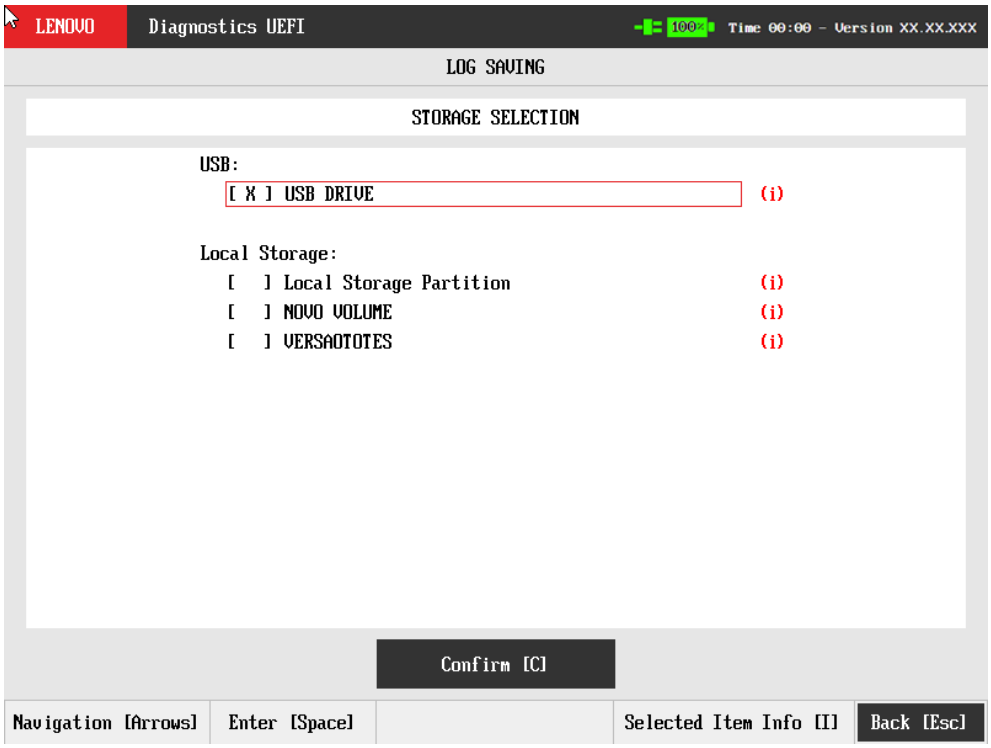

Figure 93: Storage selection - USB log saving

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.

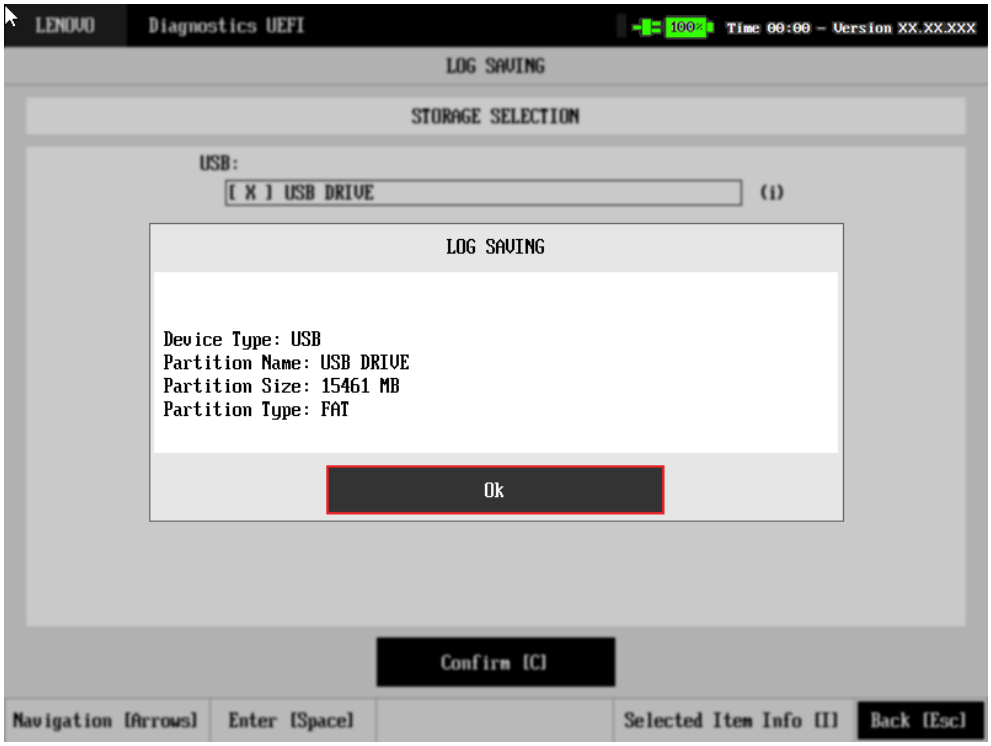

Figure 94: USB information

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.

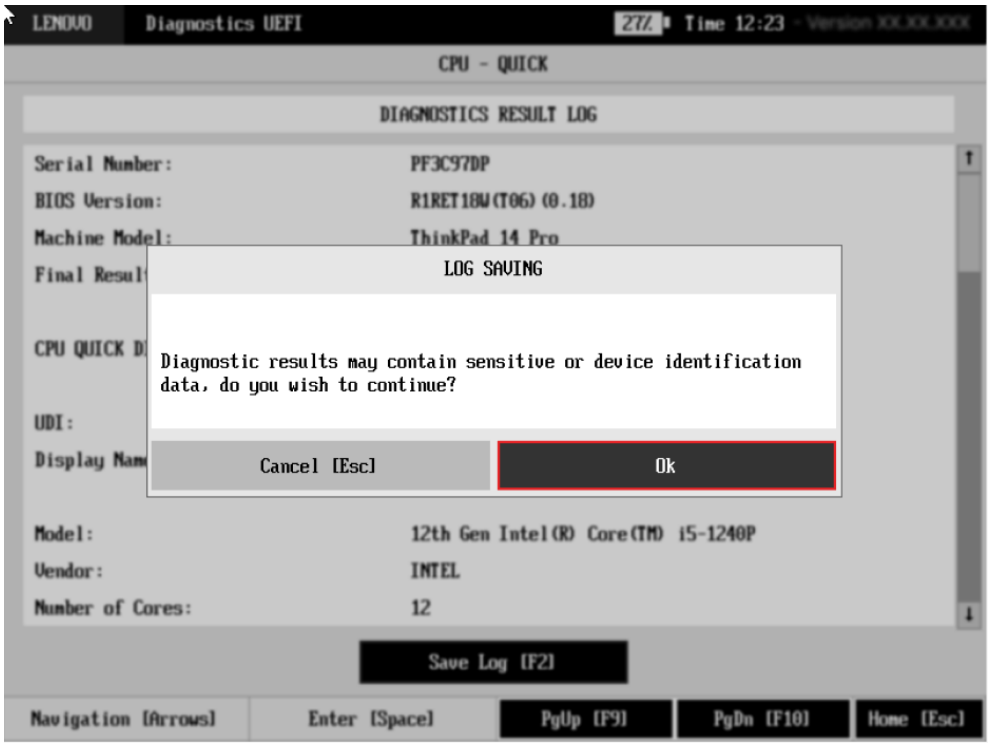

Figure 96: Sensitive information confirmation pop-up

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:

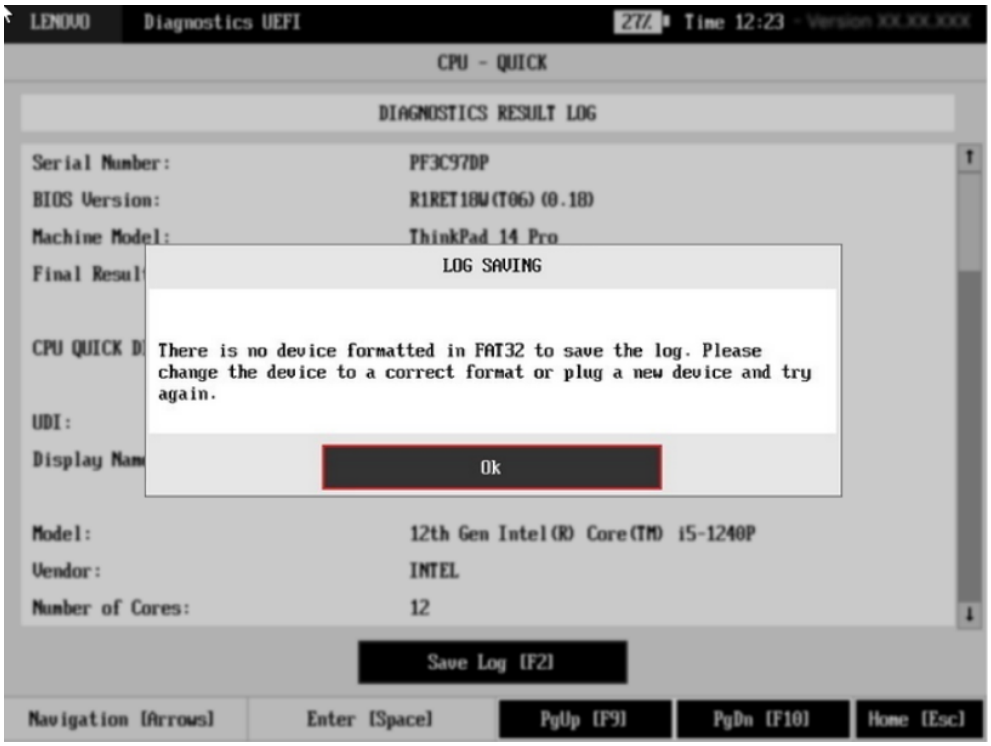

Figure 98: Format notice pop-up

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.

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.

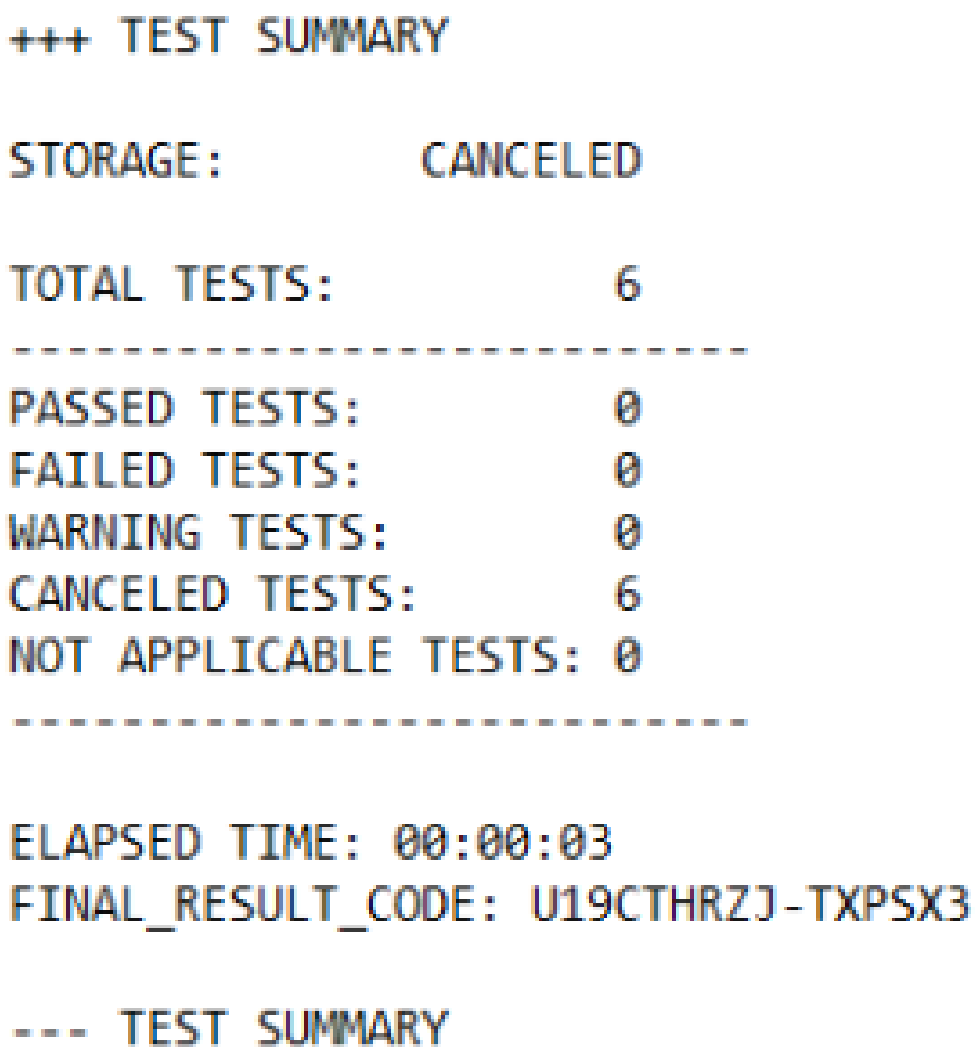

Figure 102: Results Summary

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.

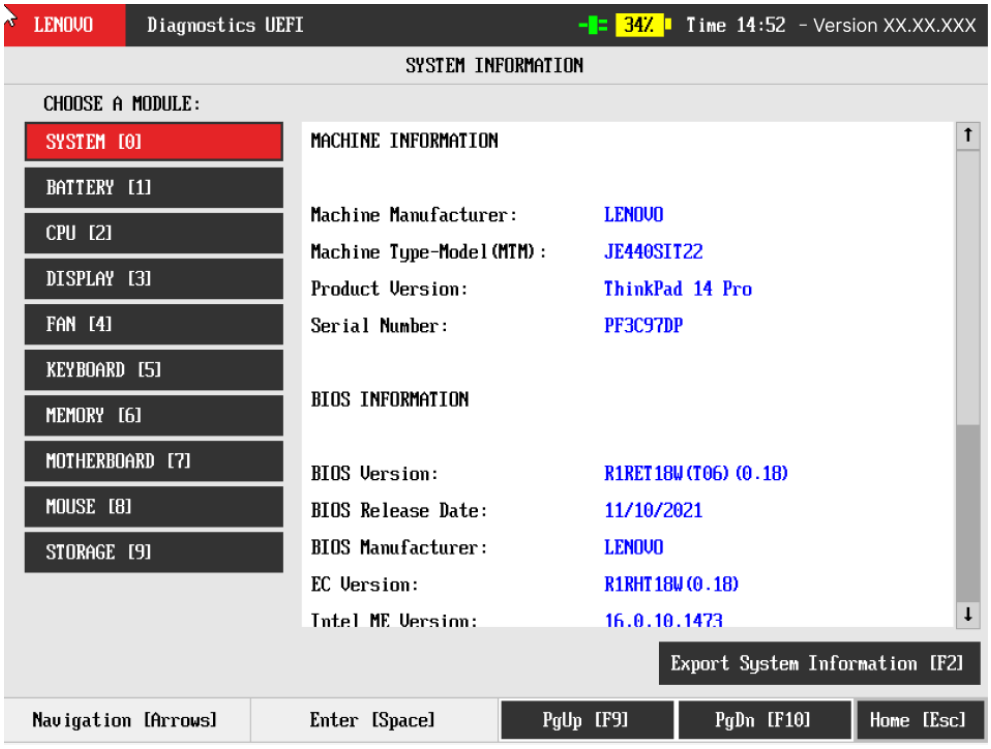

Figure 103: System information - system tab

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

Example in the figure below:

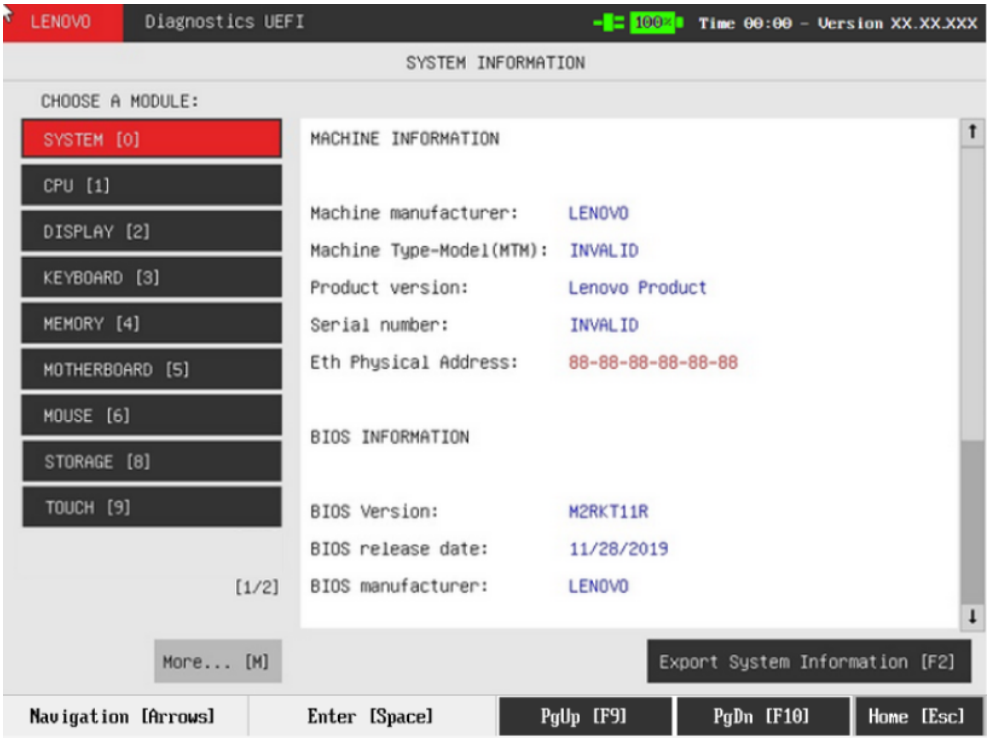

Figure 104: System information - system tab

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

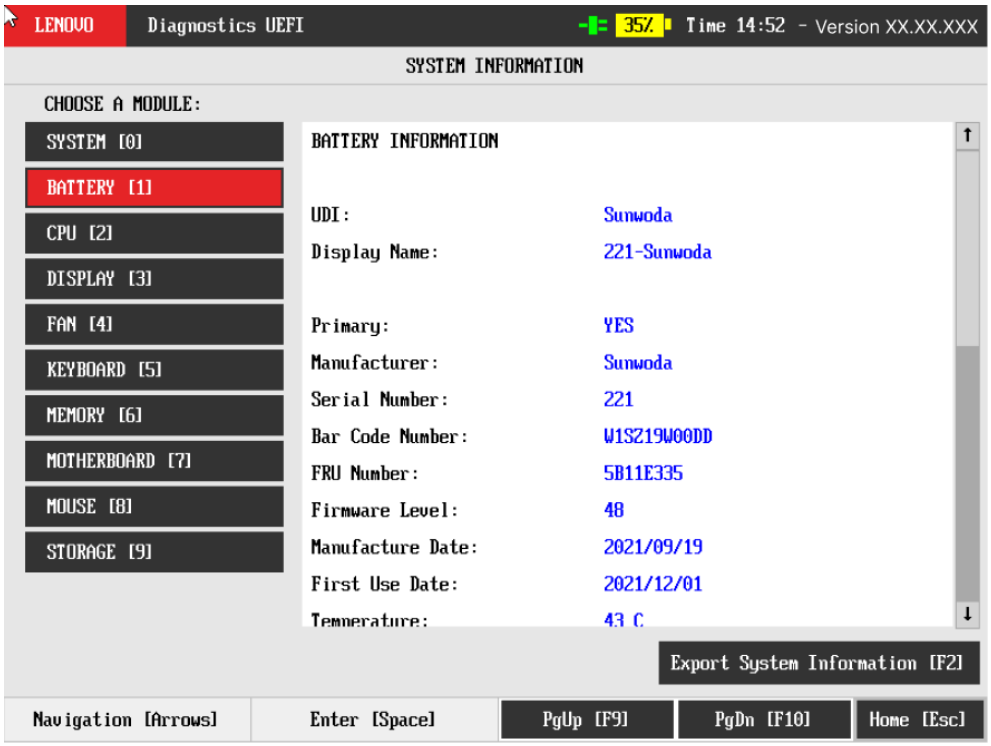

Figure 105: System information - battery tab

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

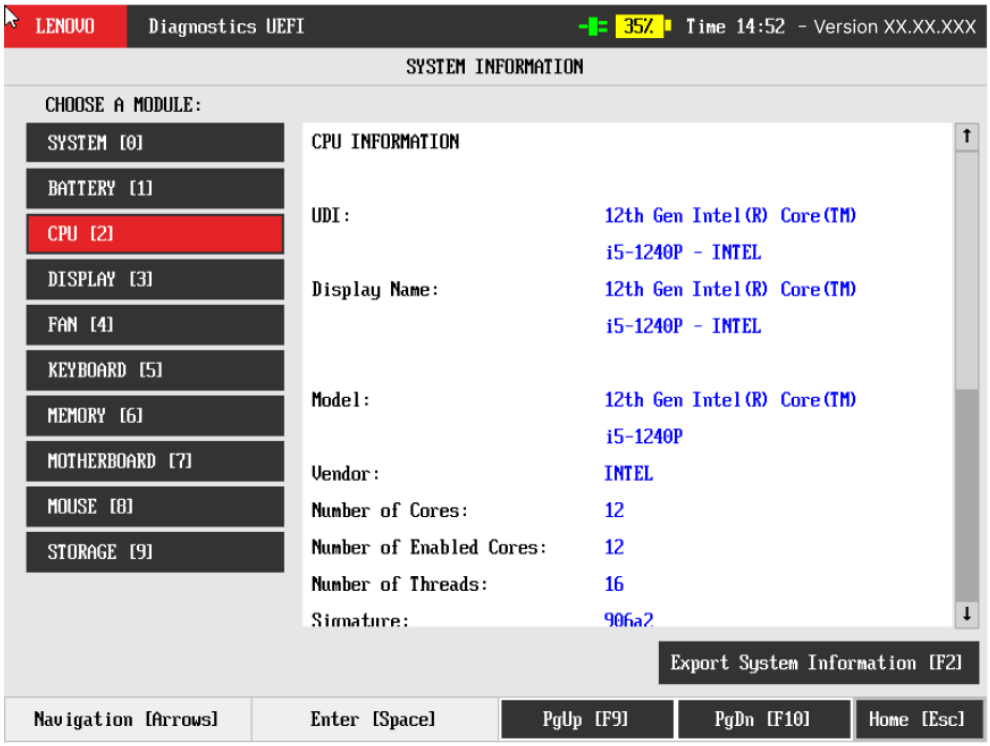

Figure 106: System information - CPU tab

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

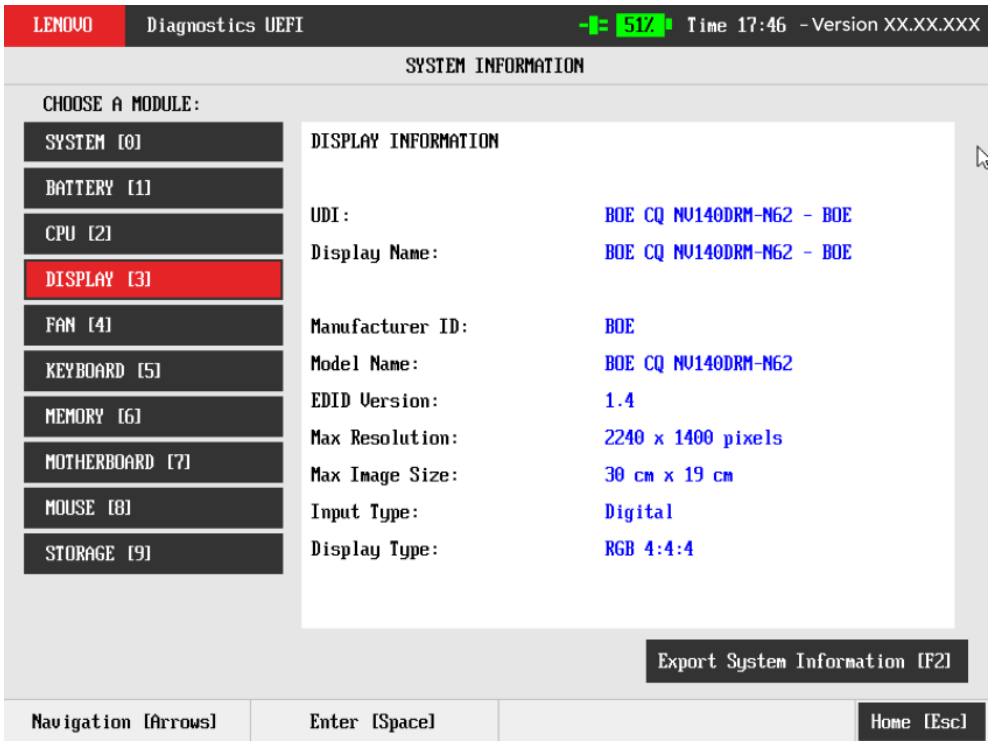

Figure 107: System information - display tab

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

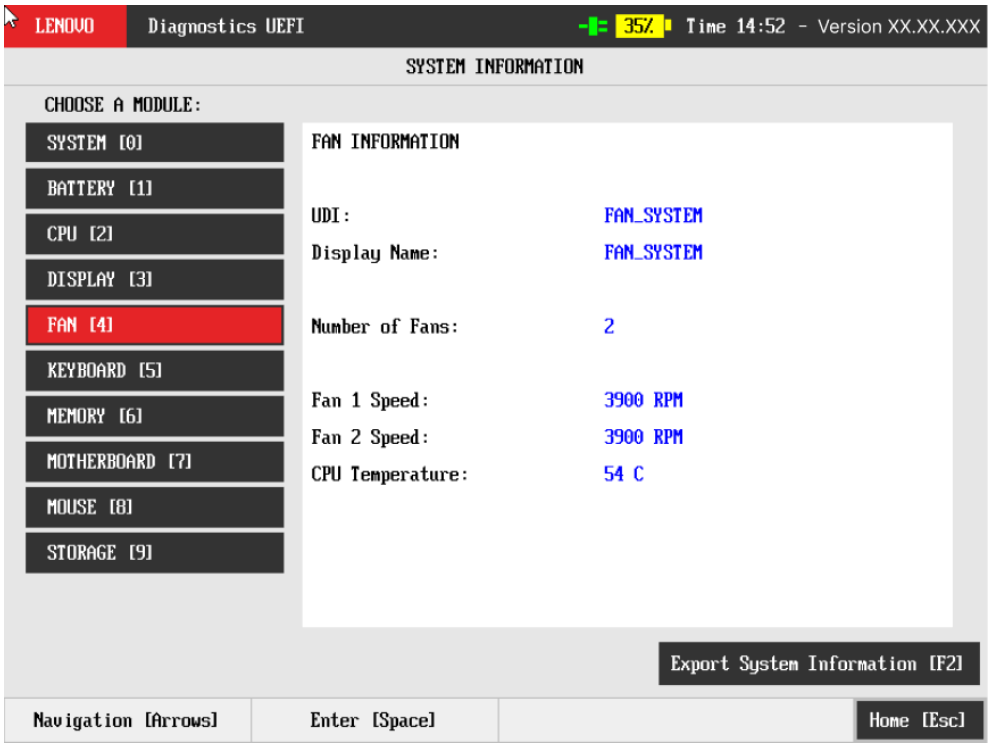

Figure 108: System information - fan tab

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

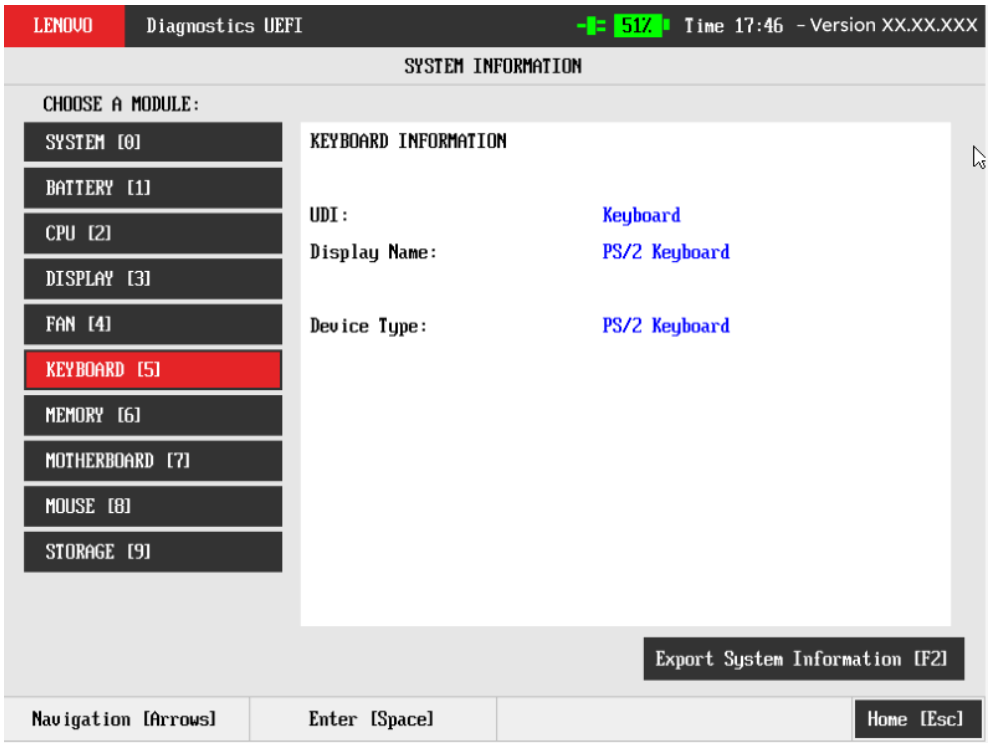

Figure 109: System information - keyboard tab

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

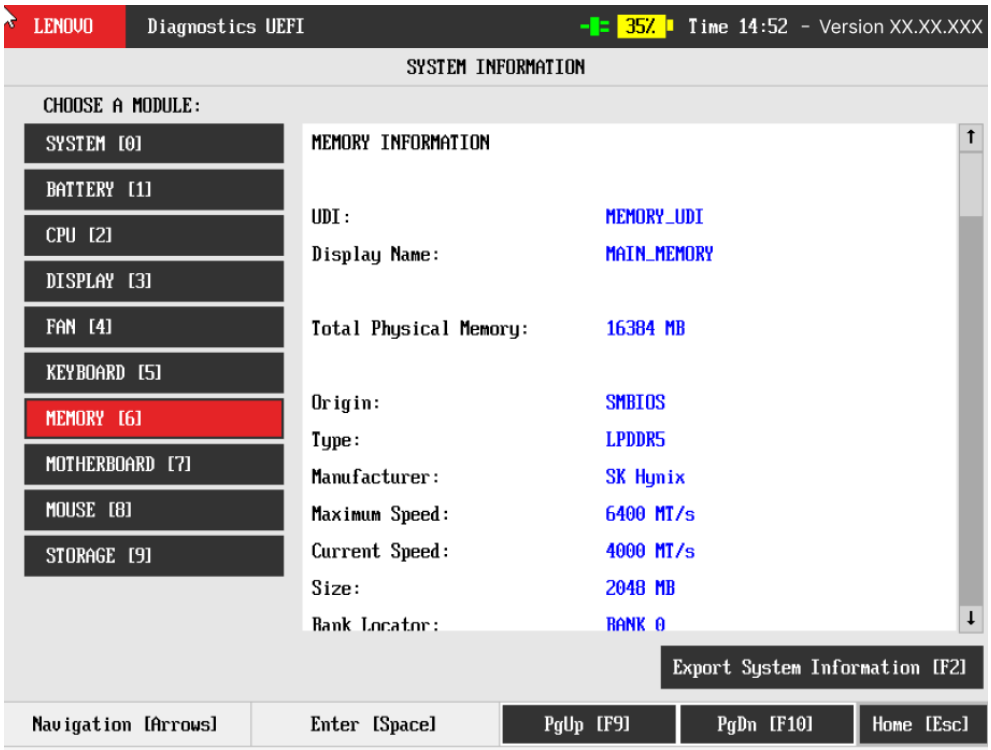

Figure 110: System information - memory tab

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

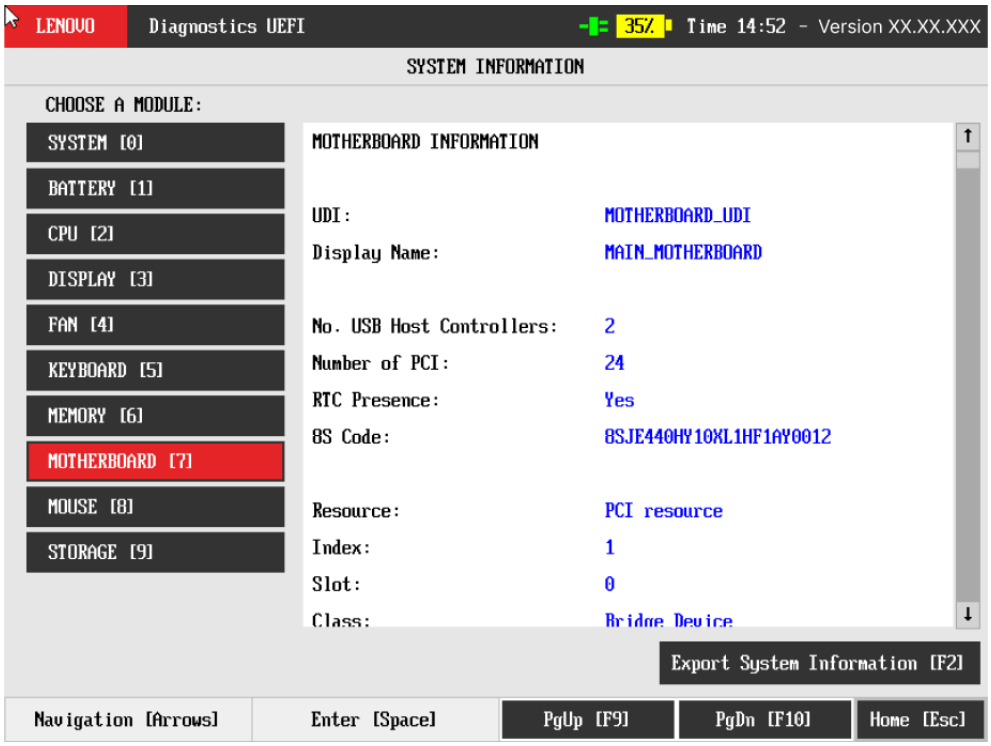

Figure 111: System information - motherboard tab

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

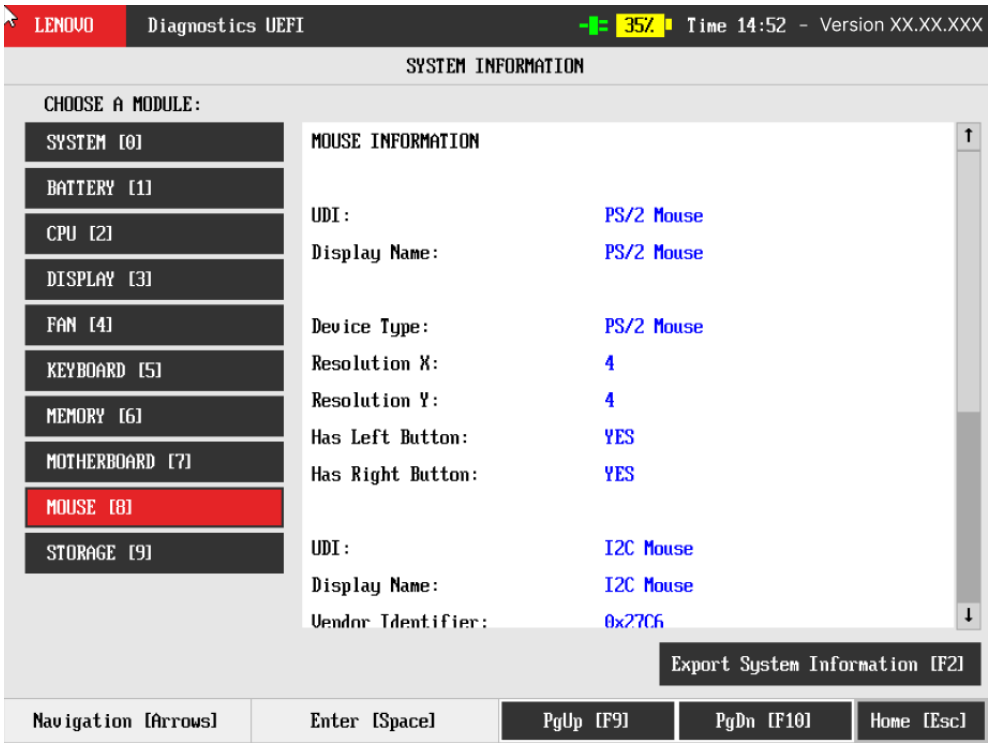

Figure 112: System information - mouse tab

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

Figure 113: System information - optical tab

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

- Physical RAID:

Figure 114: System information - physical RAID tab

- Virtual RAID:

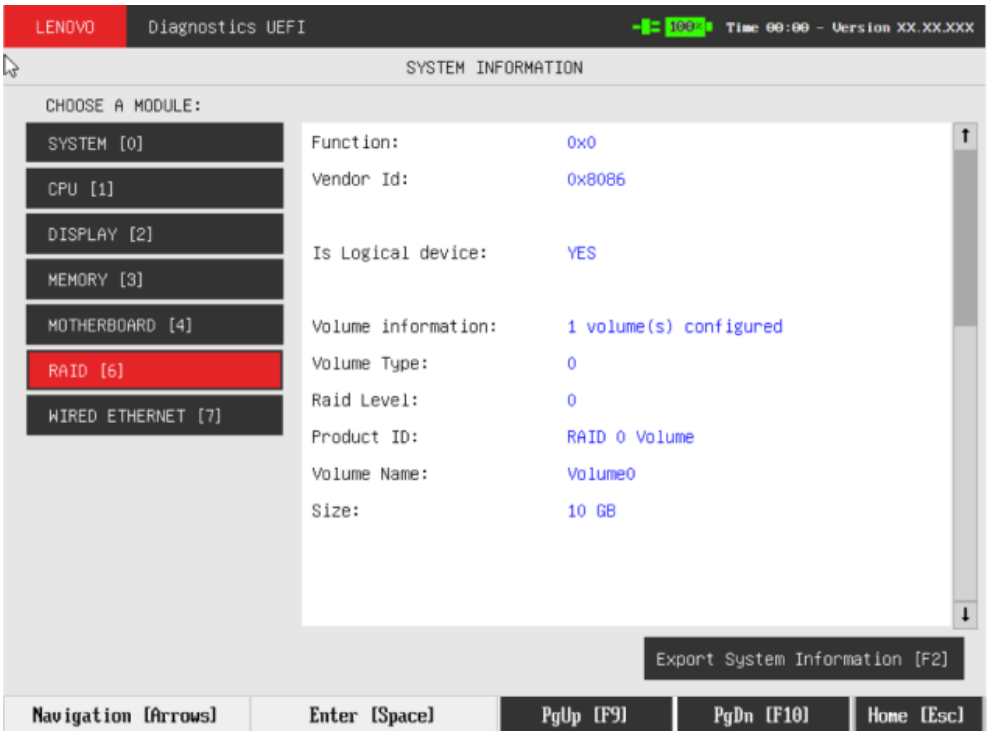

Figure 115: System information - virtual RAID tab

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

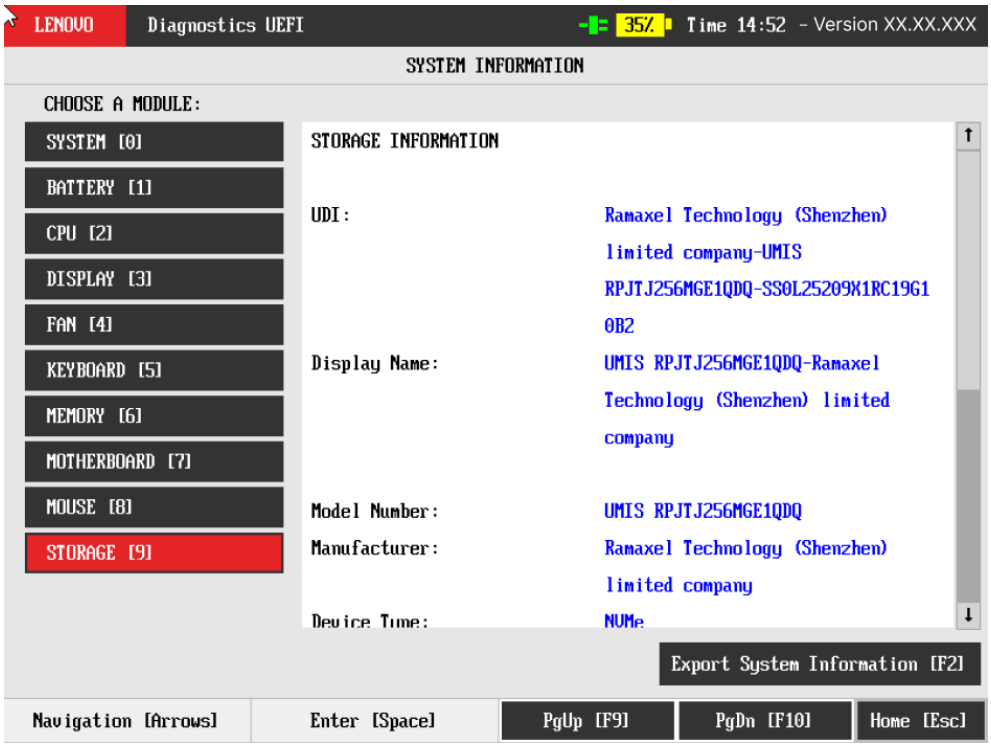

Figure 116: System information - storage tab

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

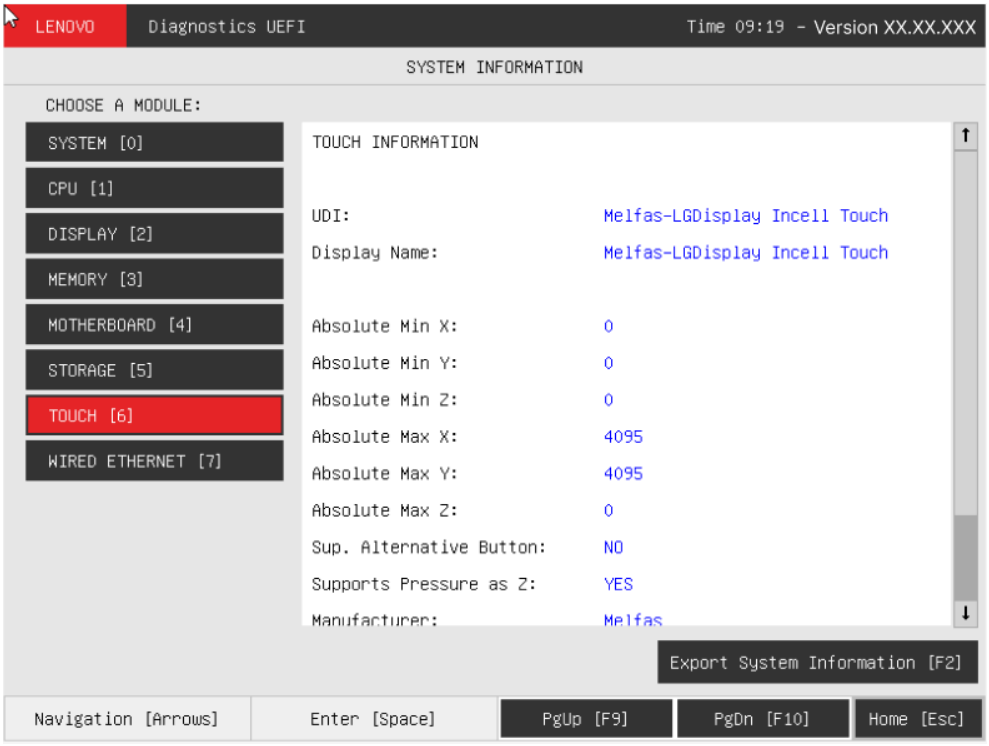

Figure 117: System information - touch tab

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

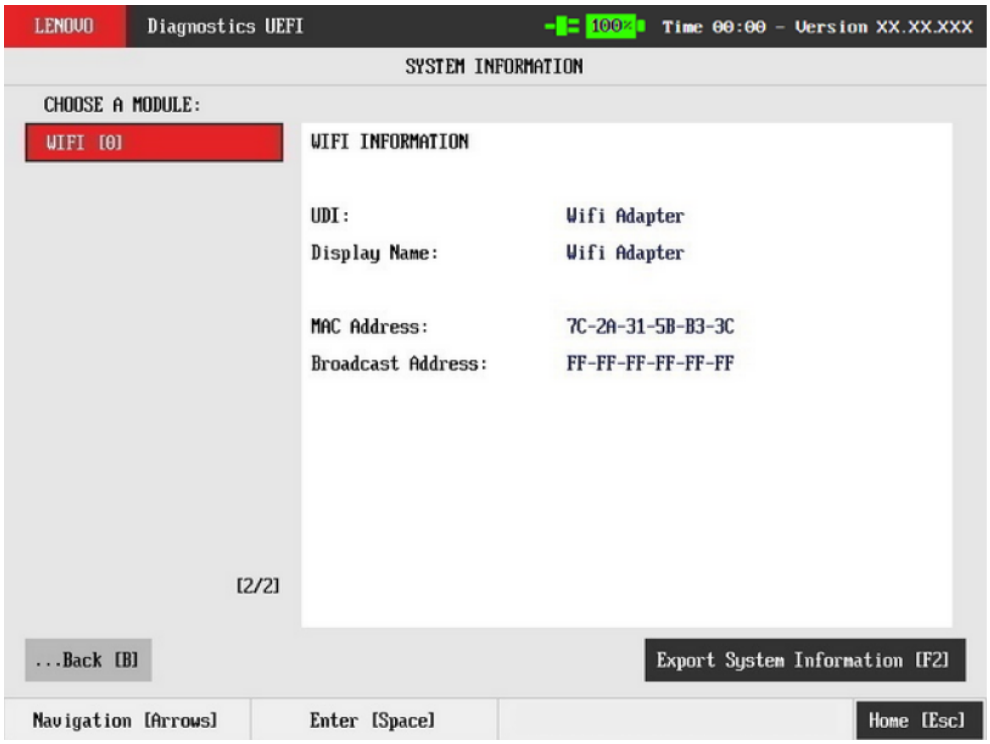

Figure 118: System information - WiFi tab

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

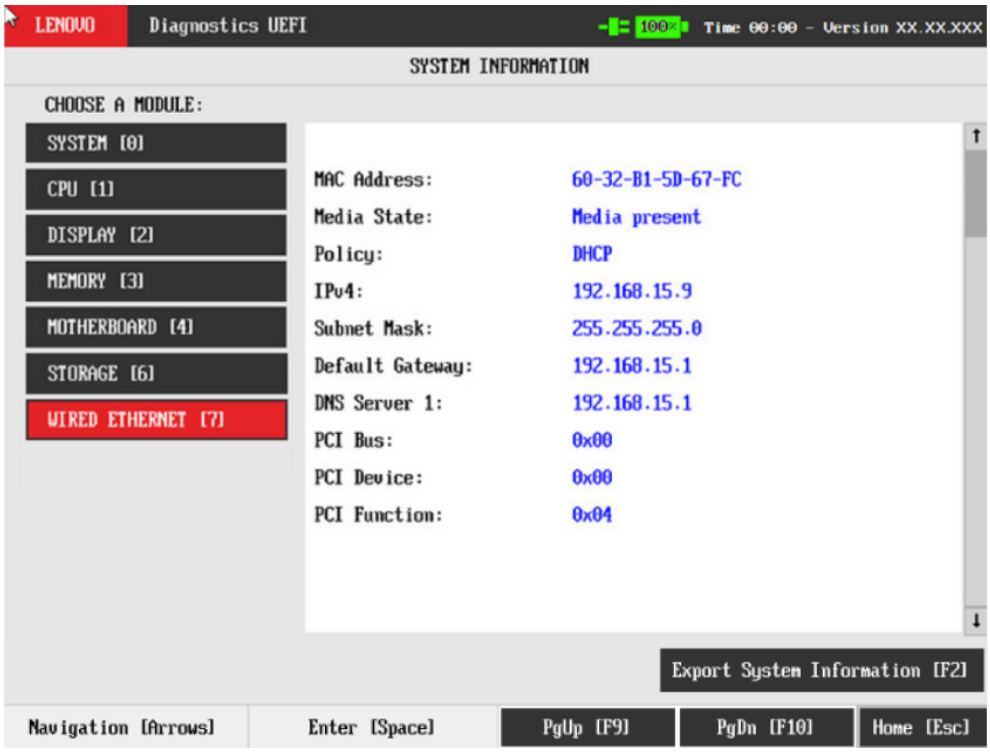

Figure 119: System information - wired ethernet tab

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.

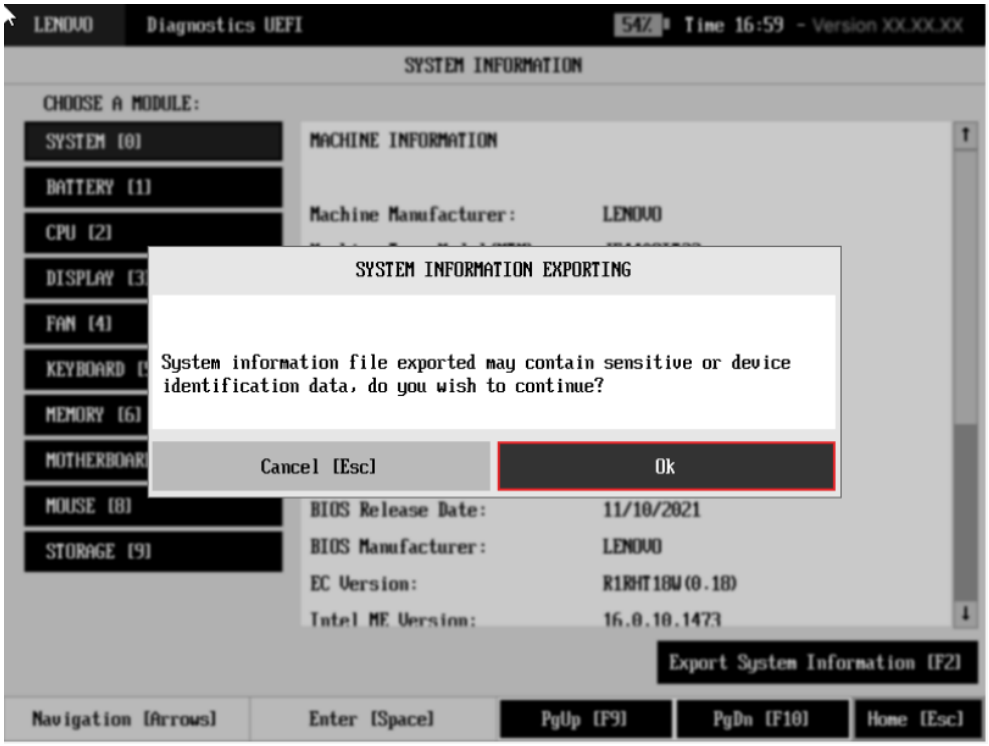

Figure 120: Sensitive information pop-up

The user can change the current tab either by using mouse/touch device (Bootable version only) or by using the up (^) and down (v) 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.

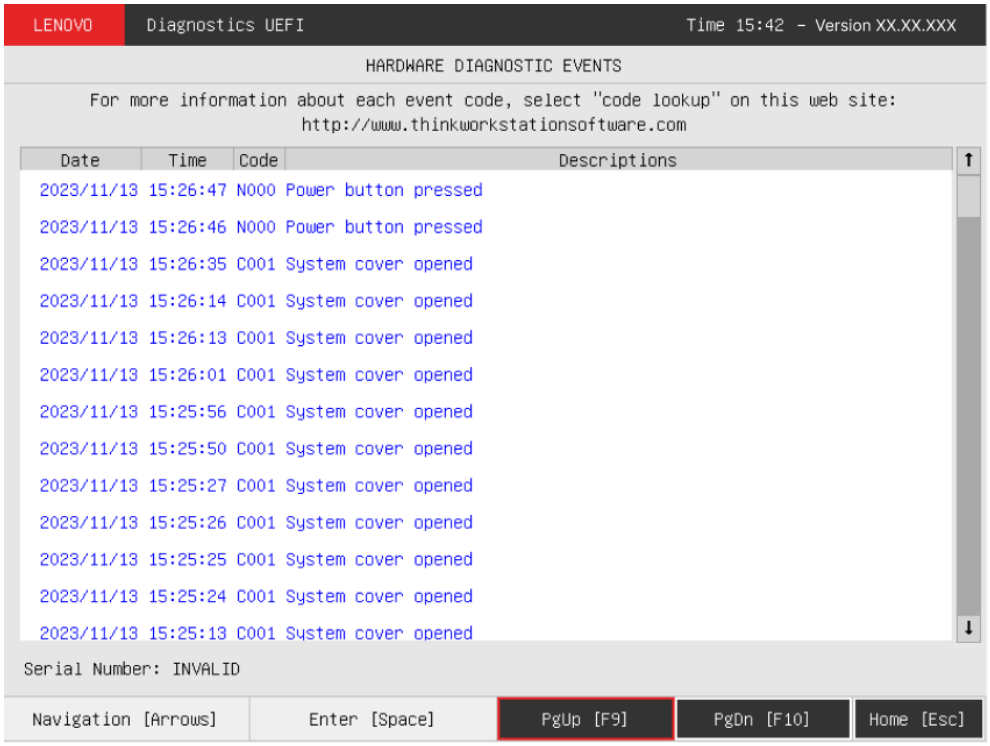

Figure 121: Hardware diagnostic events

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.

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.

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.

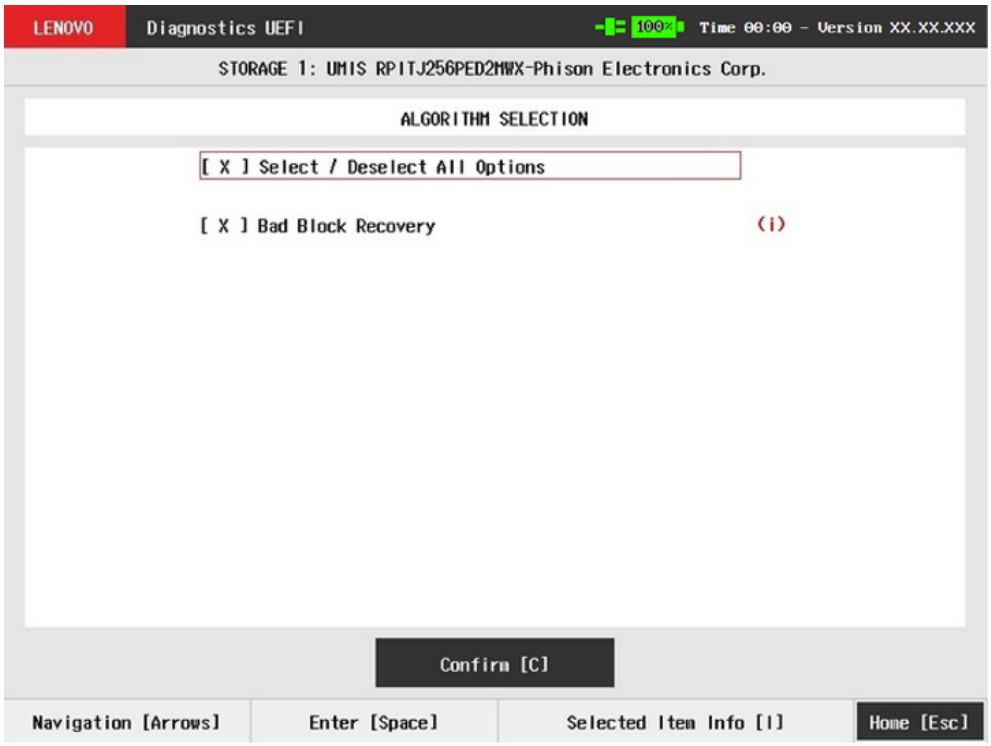

Figure 124: Bad block recovery algorithm selection

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.

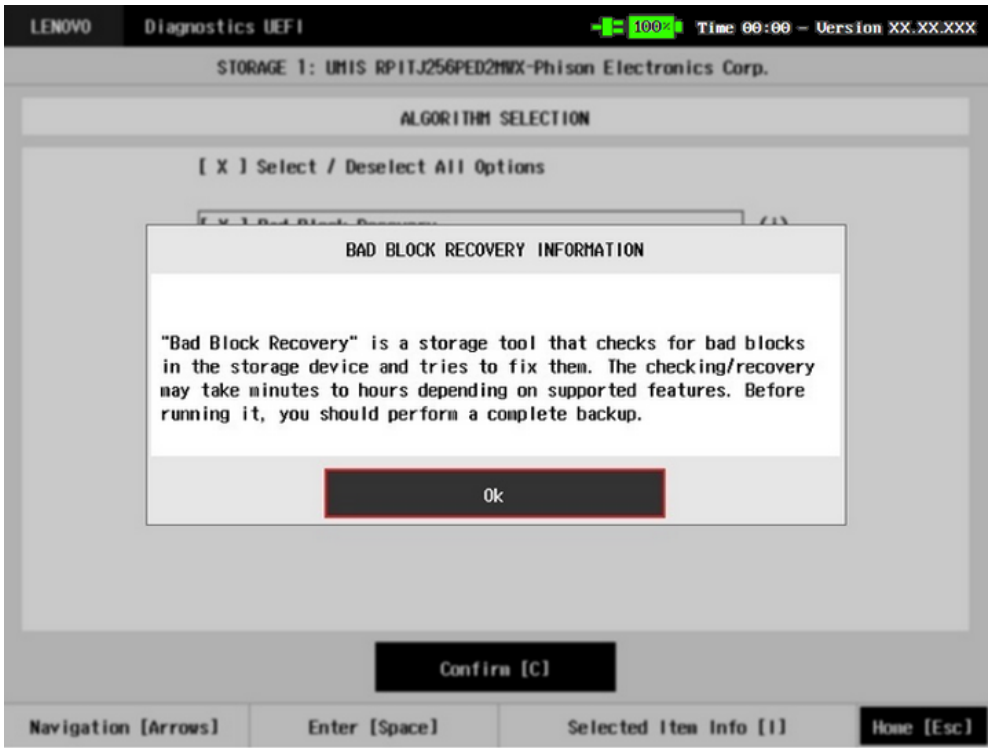

Figure 125: Bad block recovery information pop-up

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.

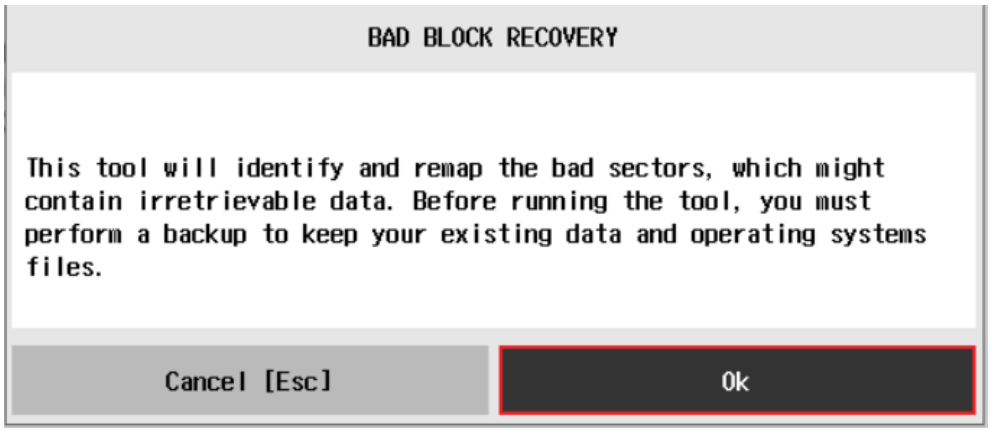

Figure 126: Bad block notice

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.

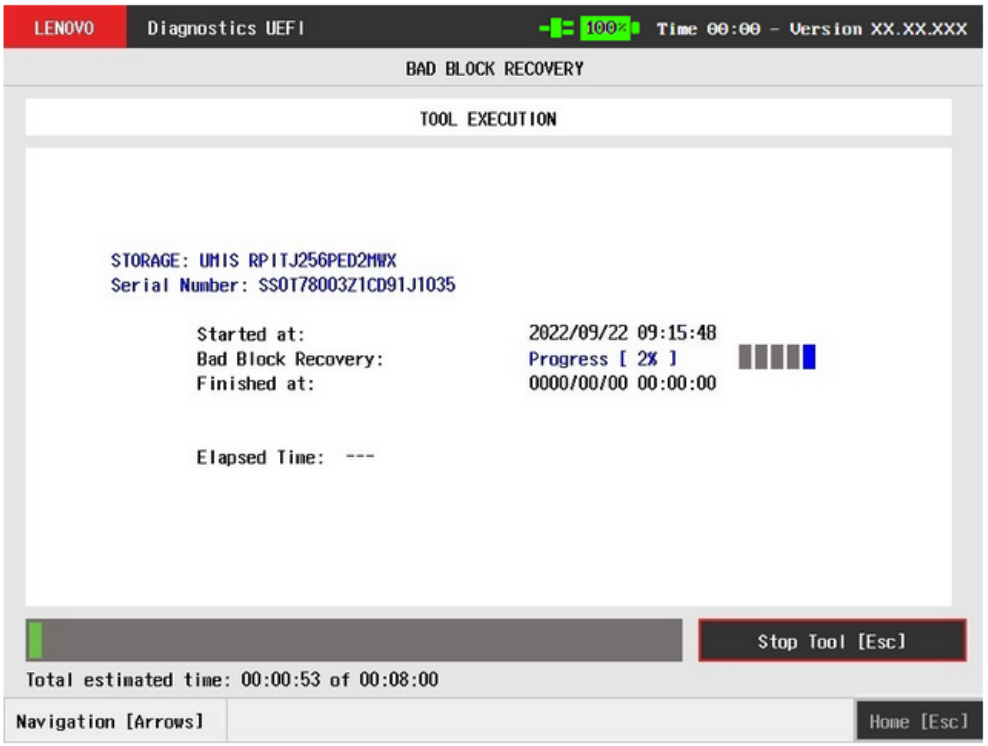

Figure 127: Bad block recovery execution

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.

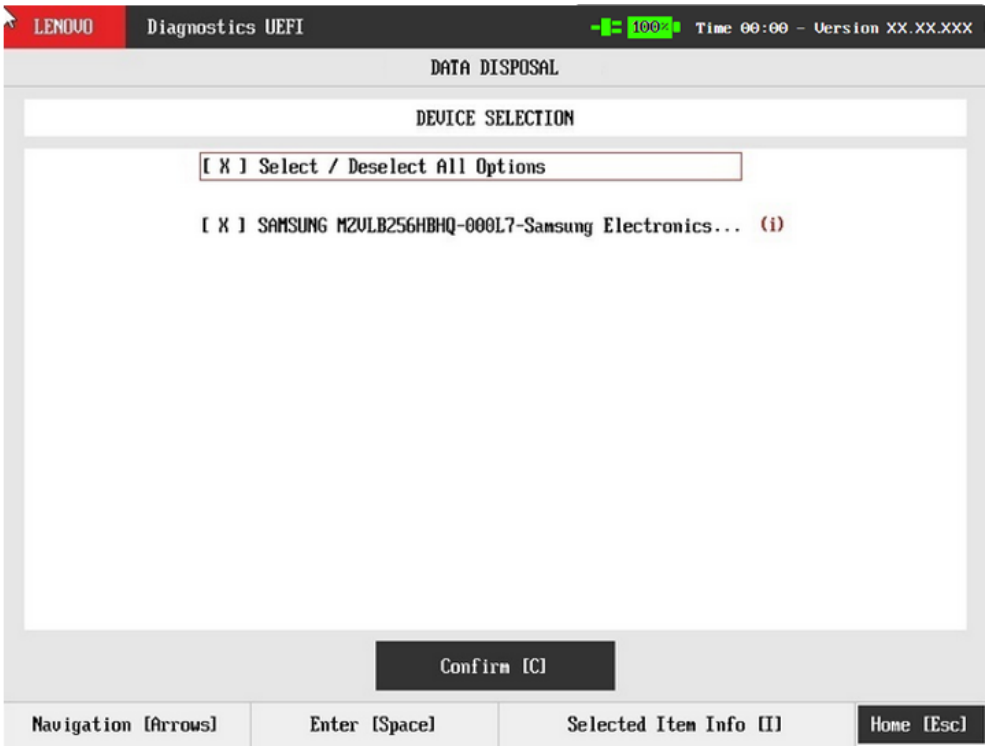

Figure 128: Data disposal device selection

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.

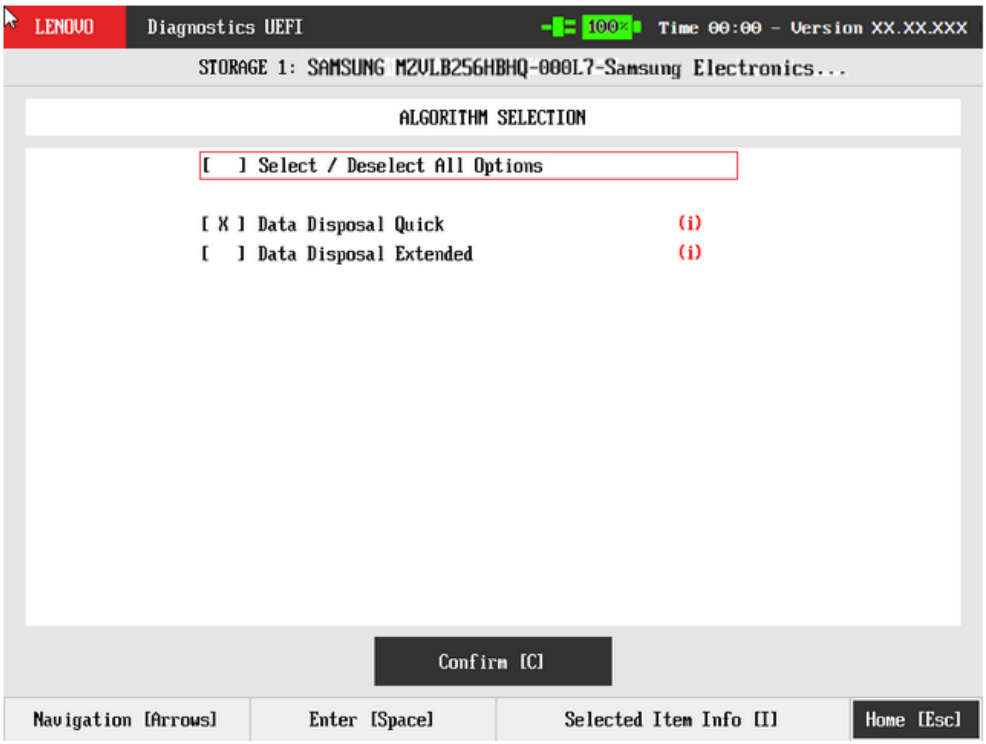

Figure 129: Data disposal algorithm selection

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.

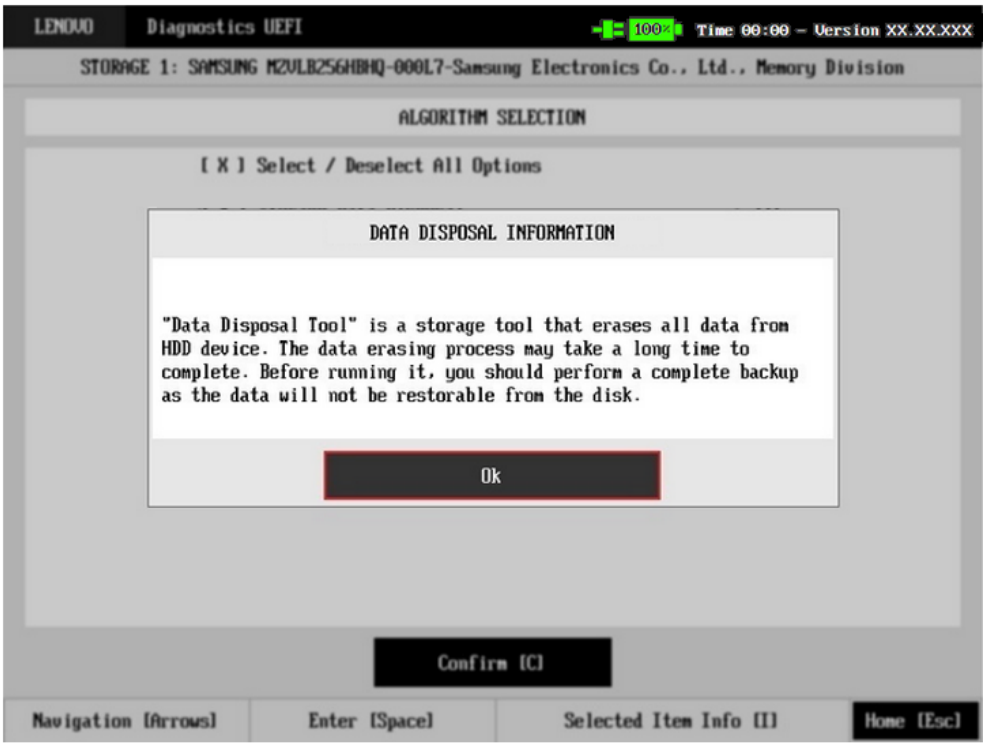

Figure 130: Data disposal information

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.

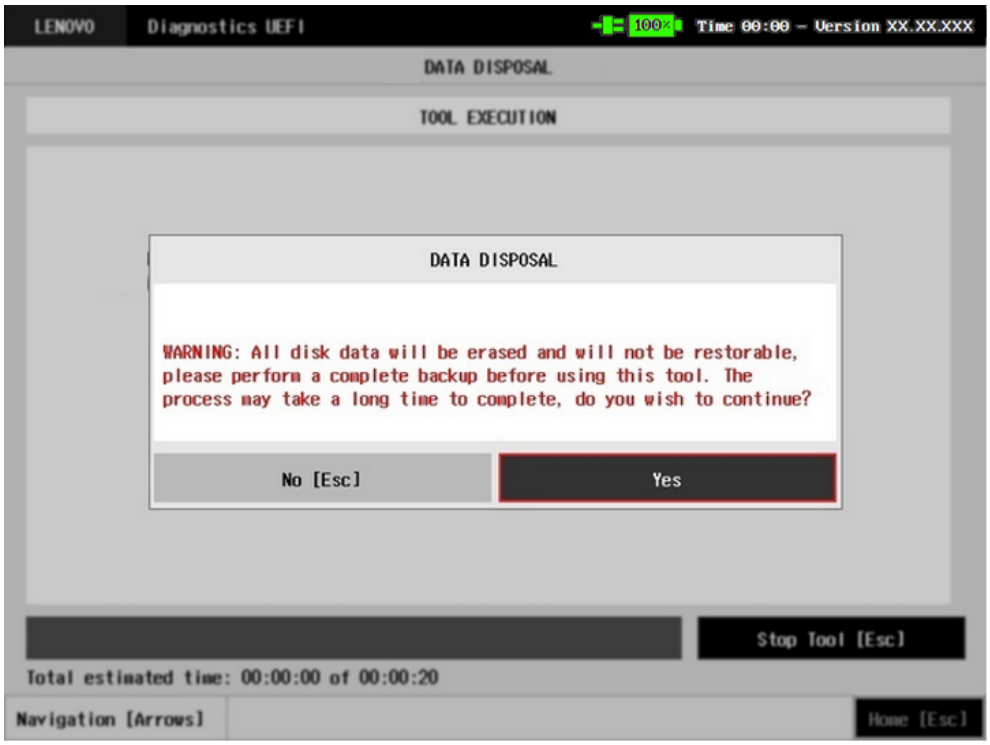

Figure 131: Data disposal warning message

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.

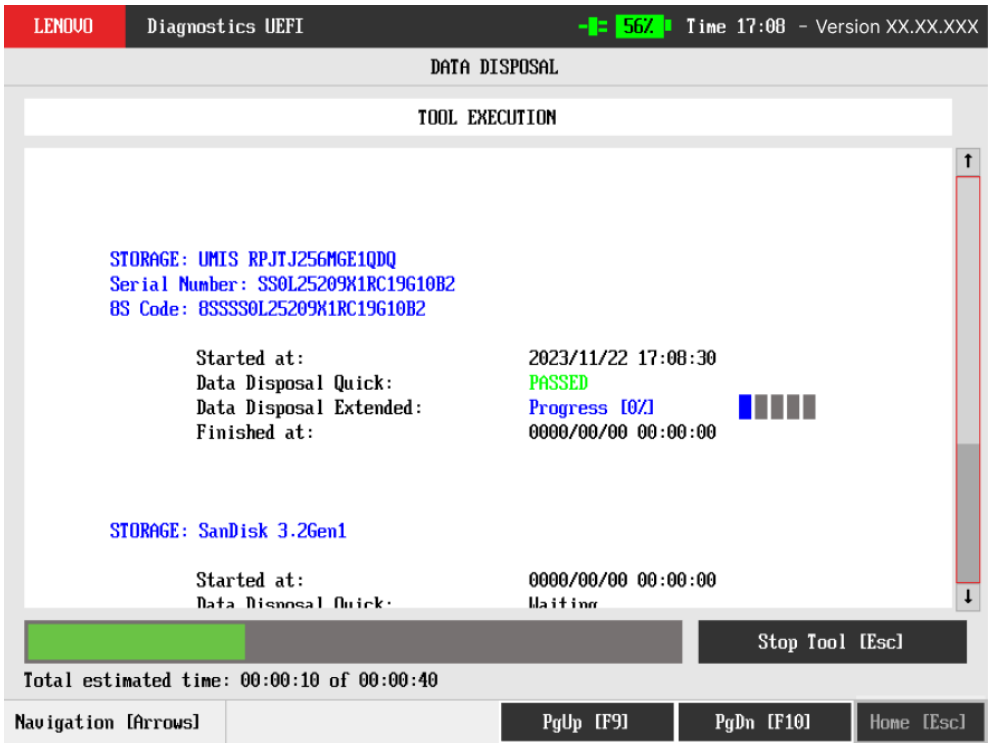

Figure 132: Data disposal execution

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.

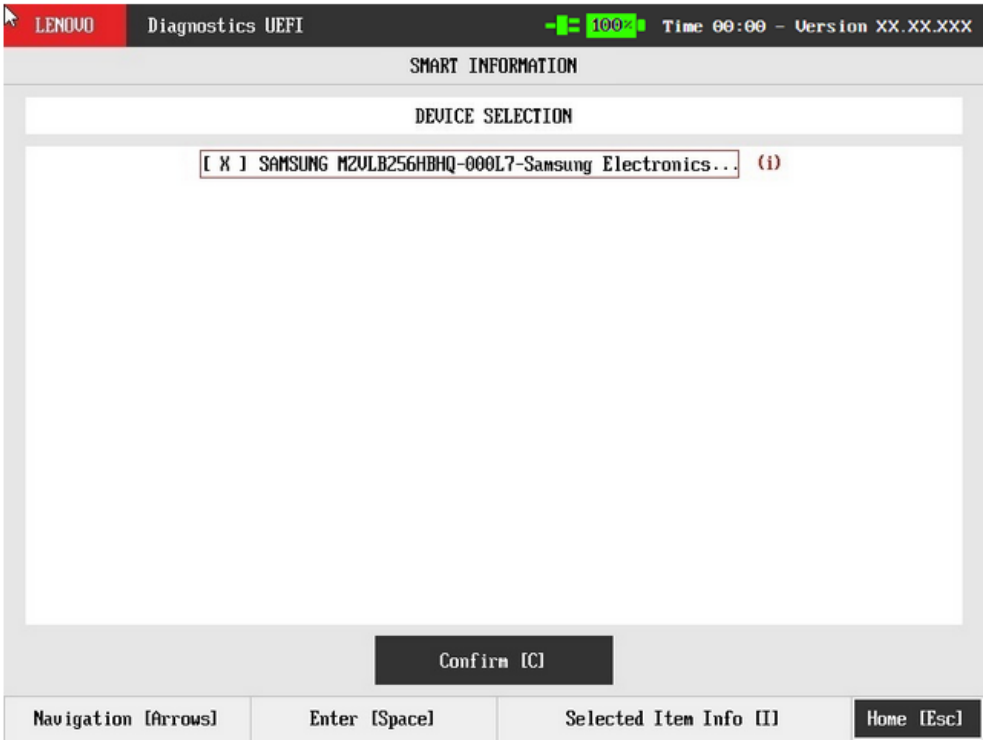

Figure 133: SMART information - device selection

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.

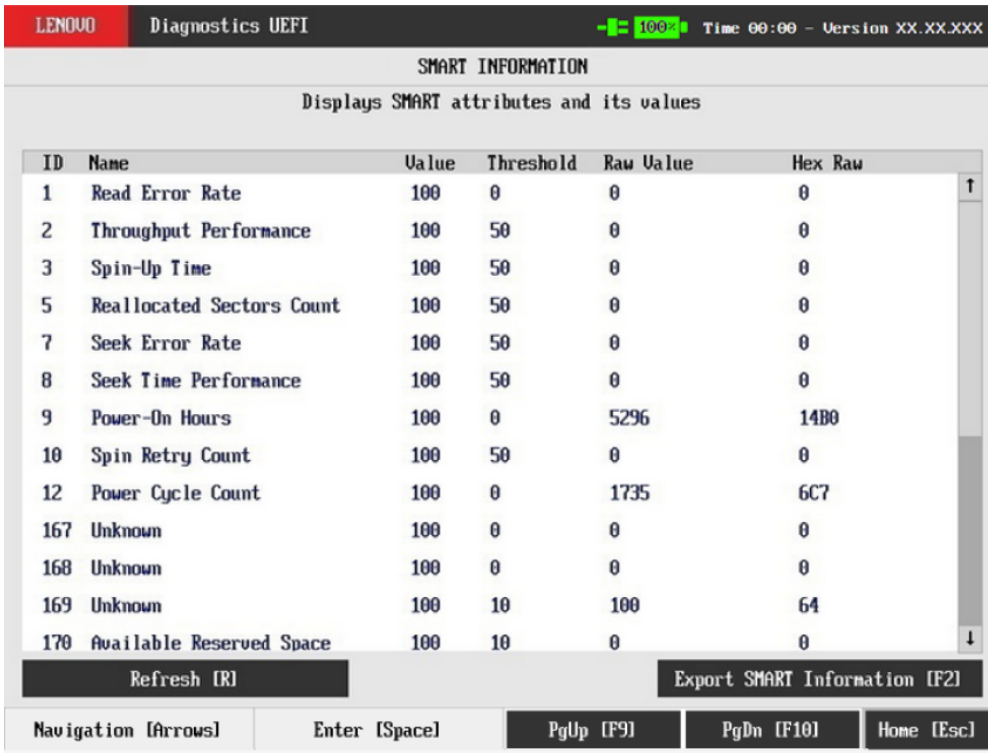

Figure 134: SMART information screen

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

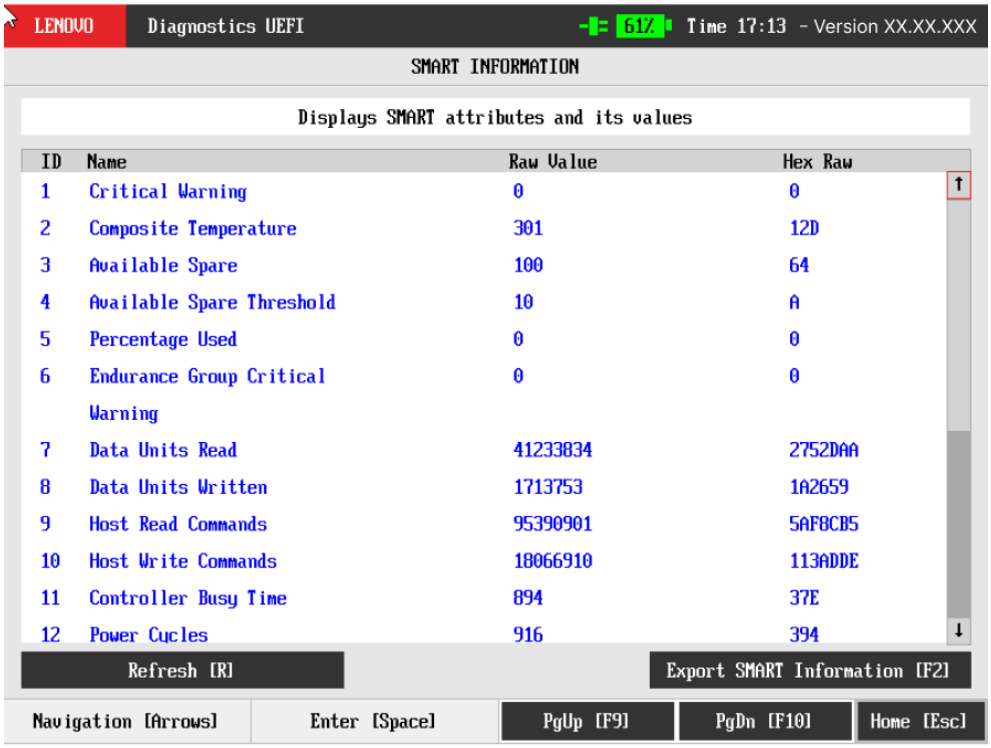

Figure 135: NVMe SMART information screen

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.

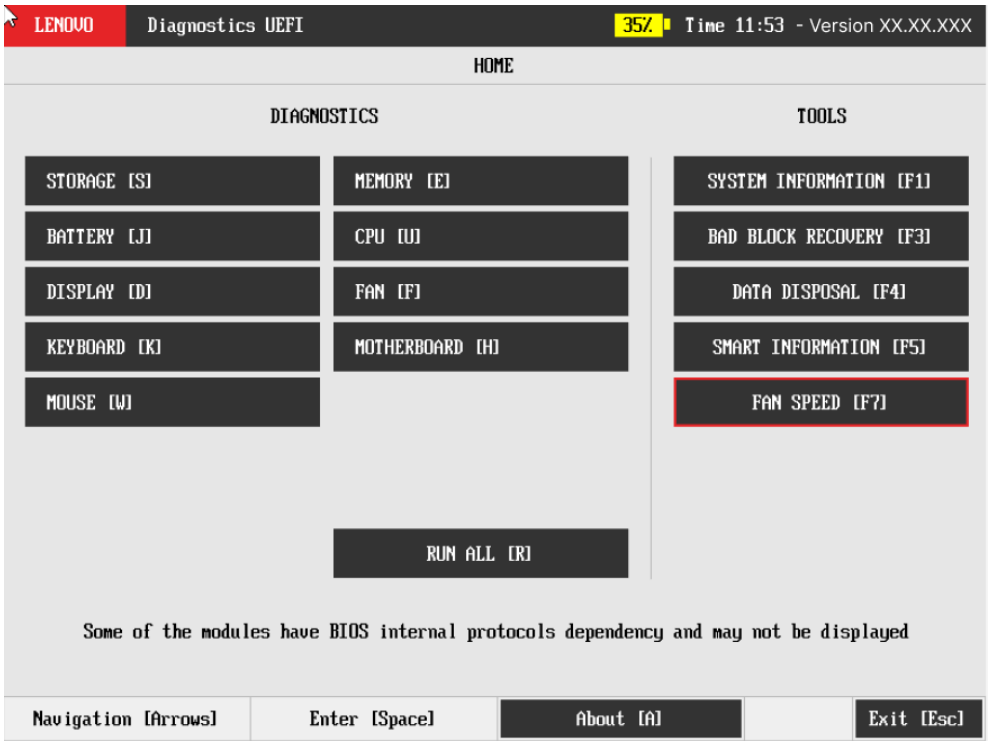

Figure 136: Fan speed tool location, on main menu

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.

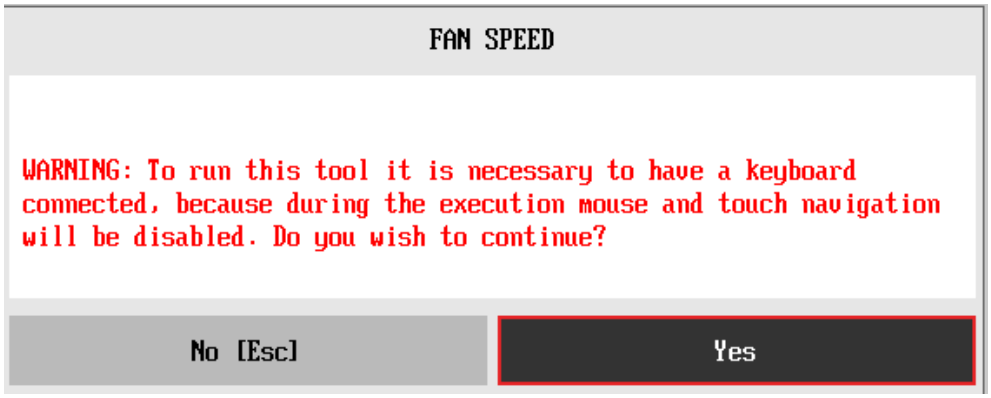

Figure 137: The tool's startup notice

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.

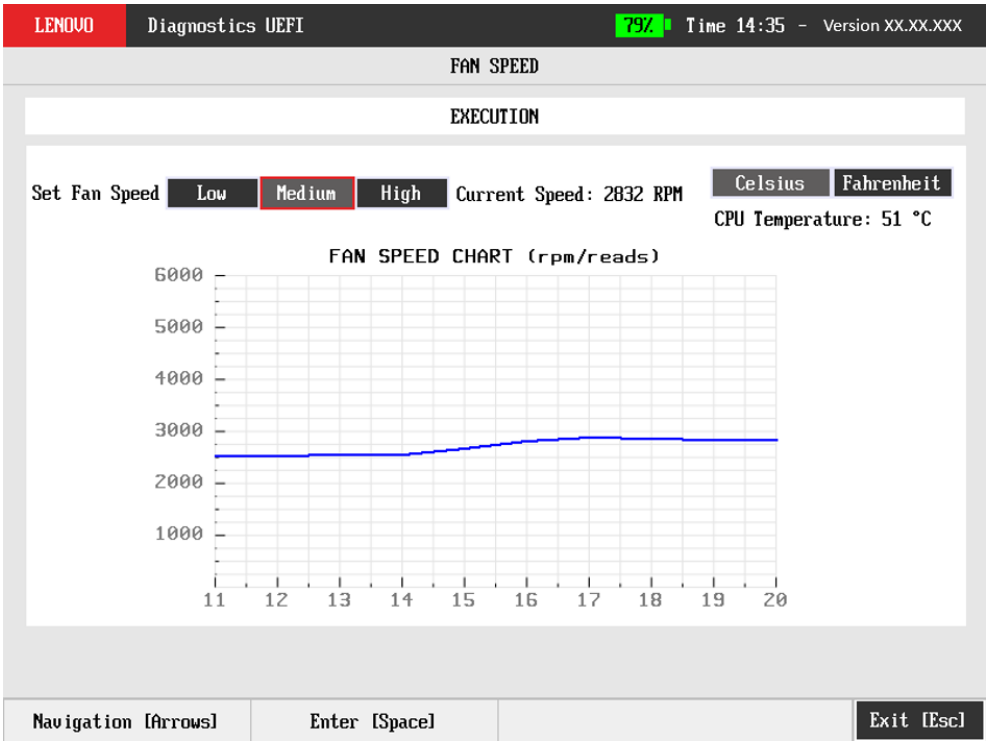

Figure 138: The tool's main screen

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	✔	✔
Bad Block Recovery	✔	✔
Battery	✔	✘
CPU	✔	✔
Data Disposal	✔	✔
Display	✔	✘
Fan	✔	✘
Fan Speed Tool	✔	✘
Fingerprint	✔	✘
Hardware Diagnostic Events	✔	✘
Keyboard	✔	✔
Memory	✔	✔
Motherboard	✔	✔
Mouse	✔	✔
Optical	✔	✘
RAID	✔	✘
Run All	✔	✔
Sensor	✔	✘
SMART Information	✔	✔
Storage	✔	✔
System Information	✔	✔
Touch	✔	✘
WiFi	✔	✘
Wired Ethernet	✔	✔

32 Terms and conditions

Over the next few pages, you are going to be introduced to Lenovo’s terms and conditions. Please, read carefully.

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edk2 (edk2-stable202202)

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src/edk2-libc/StdLib/LibC/StdLib/NumericInt.c
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Project URL: https://github.com/tianocore/edk2-libc


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OpenSSL (1.1.1j)
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Project URL:
https://github.com/openssl/openssl/tree/129058165d195e43a0ad10111b0c2e29bdf65
980


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QR-Code-generator (1.7.0)
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Project URL: https://github.com/nayuki/QR-Code-generator/archive/refs/tags/v1.7.0.zip

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ultrajson (5.1.0)
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