



BAPCo MobileMark® 25

User Guide

Revision 1.0	Initial release
Revision 1.1	Corrected command line installation syntax
Revision 1.2	Added section on Virtualization Based Security
Revision 1.3	Updates to setup and run procedure. Grammar and typo corrections

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Introduction

MobileMark 25 is an application-based, performance-qualified battery life benchmark designed to assist users in making PC purchasing decisions.

Setup

Before attempting to install or run MobileMark 25, verify that the test system under test (SUT) meets the recommended minimum system configuration for running the benchmark. Results run on systems that do not meet the minimum requirements are valid for publication, however BAPCo will not be able to offer technical support for those configurations.

- System running on DC battery power
- **CPU:**– CPU: 2015 or newer x86 processor (Intel 6th Generation Core or AMD 7000 series APU)
- **RAM:** 8 GB
- **HDD/SSD:** 25 GB of free space on the primary drive
- **Operating System:** Microsoft® Windows® 10 64-bit version 19H2 or higher
- **Resolution:** 1280x800 or 1366x768, 2gb of VRAM
- **Graphics:** DirectX 12 compatible
- **Network:** Associate to Wi-Fi network

Pre-installation Image configuration

For best results, install MobileMark 25 to a clean instance of a supported operating system, with updated hardware drivers. See the [APPLICATIONS](#) section for a list of application software installed by the benchmark. MobileMark 25 includes an integrated configuration tool that will automate making changes to the system in preparation for running the benchmark. See the [SYSTEM CONFIGURATION TOOL](#) section for more information on image configuration.

- **Administrative rights:** An account with administrative privileges is required. The same account must be used to install and run MobileMark 25 and the account must be configured for auto-logon.

Virtualization Based Security

Default enablement

Starting with Windows 11, new installations on compatible systems have memory integrity turned on by default. This is changing the default state of the feature in Windows, though device manufacturers and end users have the ultimate control of whether the feature is enabled.

Hardware features for automatic enablement

Memory integrity will be turned on by default when a PC includes the following minimum hardware features:

HARDWARE FEATURES FOR AUTOMATIC ENABLEMENT	
Component	Detail
Processor	<ul style="list-style-type: none">• Intel 11th generation Core processors and newer• AMD Zen 2 architecture and newer• Qualcomm Snapdragon 8180 and newer
RAM	Minimum 8GB
Storage	SSD with a minimum size of 64GB
Drivers	HVCI-compatible drivers must be installed. See Hypervisor-Protected Code Integrity (HVCI) for more information about drivers.
BIOS	Virtualization must be enabled

Microsoft Office Removal

MobileMark 25 installs a copy of Microsoft Office 2019. All traces of Office, including UWP Office app and/or Office 365 installations must be removed from the system before attempting to install MobileMark 25. Neglecting to remove an existing Office installation will cause installation failures.

Follow the instructions at the [Microsoft Office removal tool](#) page to remove your version of Office prior to attempting to install MobileMark 25. If the Microsoft Office removal tool does not completely remove Microsoft Office from your system, follow [Microsoft's manual office removal procedure](#).

Remove any Office UWP apps

- Open PowerShell as administrator: Hit Windows+X, and then choose the “Windows PowerShell (Admin)” option from the Power User menu.
- At the PowerShell prompt, type the following command and press Enter after each command to remove pre-installed apps that may interfere with benchmark execution on the system under test:
 - Get-AppxPackage *officehub* | Remove-AppxPackage
 - Get-AppxPackage *OneNote* | Remove-AppxPackage
 - Get-AppxPackage *Office* | Remove-AppxPackage

MobileMark 25 installation

BAPCo recommends using disk image software to make a backup of the disk prior to installation of MobileMark 25. Although uninstallation is supported, re-installation is not supported due to DRM restrictions. BAPCo recommends making a backup of your image before installing MobileMark 25 to make image recovery easier.

To avoid invalidating the MobileMark 25 installation, verify the following items prior to attempting installation:

Remove Microsoft Office, Adobe Acrobat, Adobe Photoshop, or any other pre-existing installed application(s) that are bundled with the benchmark. See the [APPLICATIONS](#) section for the list of applications that MobileMark 25 installs and/or uses.

- Disable Windows Tamper Protection
- Set system date and time to the correct values. Do not change system date and time once MobileMark 25 is installed.

Follow these steps to install MobileMark 25:

- 1) Download MobileMark 25 from the BAPCo store.

- a. Make a backup copy of the download zip to a USB key or other external drive for safe keeping.
- 2) Unpack the benchmark files.
 - a. Create a folder called MobileMark25 and unpack the contents of the store download.
- 3) Using Windows Explorer, navigate back to the Disc1 folder created in Step 2.
- 4) Be sure all pre-installation checks are complete before attempting installation.
- 5) The system time and date must be correct and should not be changed once MobileMark 25 is installed.
- 6) MobileMark 25 now supports running the test while connected to the Internet. However, do not connect to the Internet during installation.
- 7) Double click on the file named MobileMark25_setup.exe and follow the prompts to complete the installation.



Figure 1: MobileMark 25 installer window

Read and accept the BAPCo software EULA by clicking the option 'I accept the terms of the License Agreement', then click 'Next'.

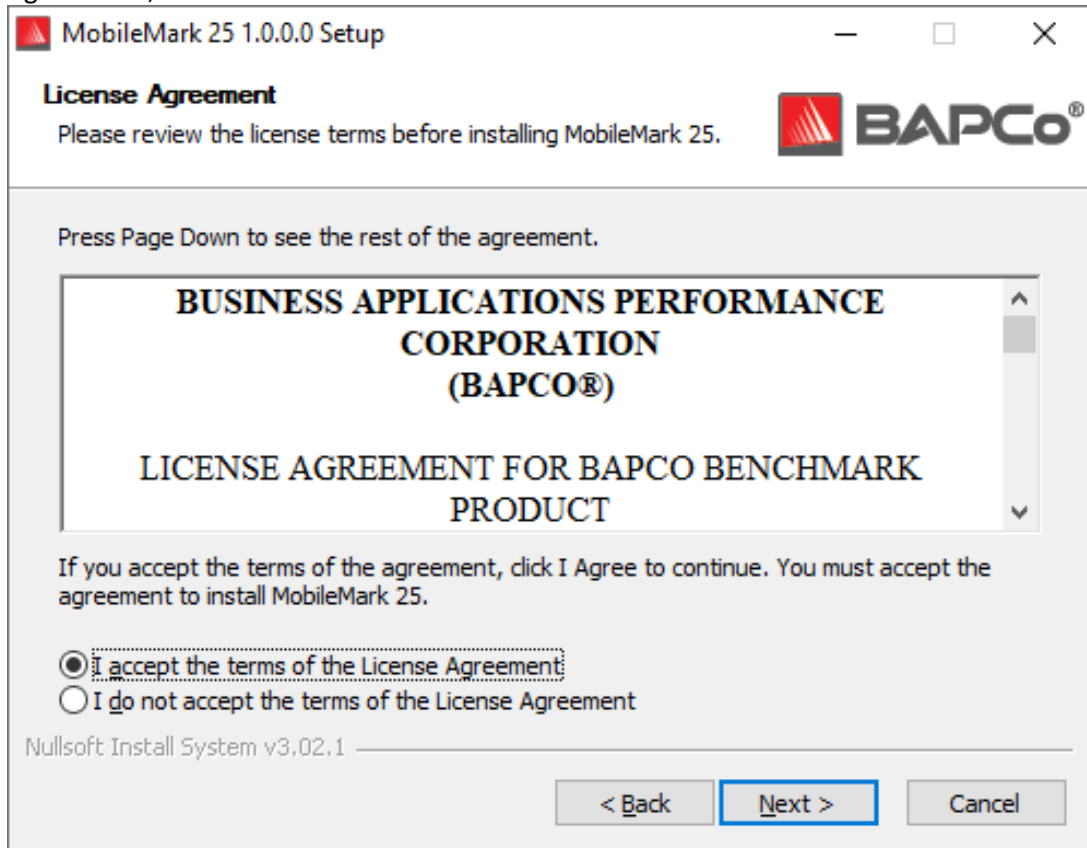
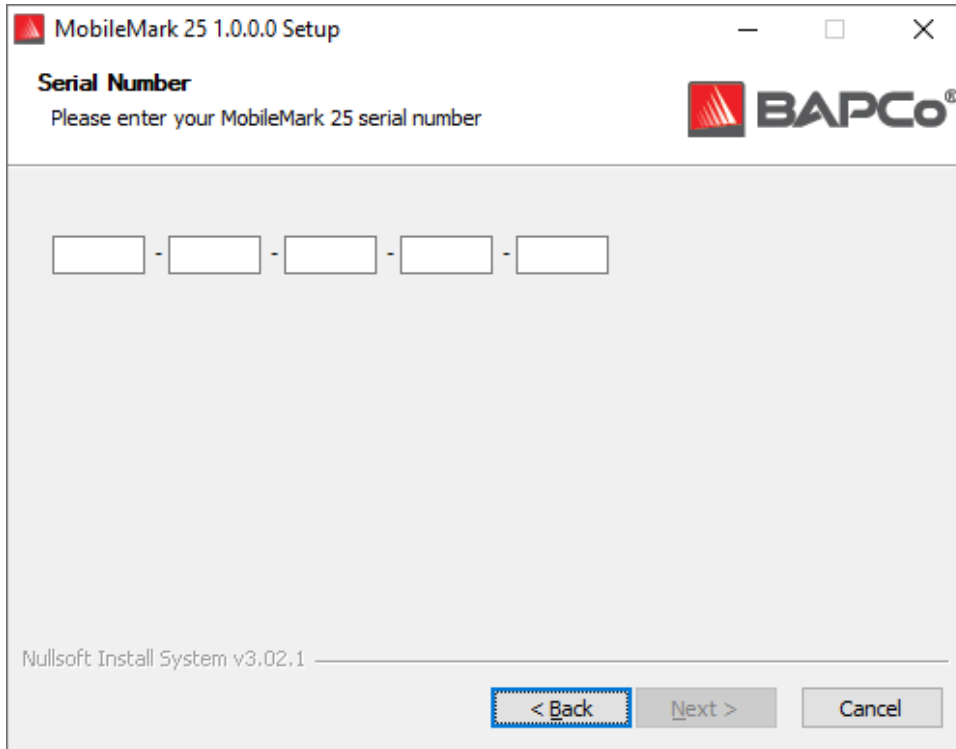


Figure 2: MobileMark 25 EULA

Enter the serial number provided with the benchmark package and click 'Next' to continue.

If you need a serial number, please contact BAPCo at sales@bapco.com



The image shows a Windows-style setup window titled "MobileMark 25 1.0.0.0 Setup". The window has a standard title bar with minimize, maximize, and close buttons. Inside the window, the text "Serial Number" is displayed in bold, followed by the instruction "Please enter your MobileMark 25 serial number". To the right of this text is the BAPCo logo. Below the instruction, there are five empty text boxes separated by hyphens, intended for entering a serial number in the format XXX-XXX-XXX-XXX-XXX. At the bottom of the window, there is a status bar that reads "Nullsoft Install System v3.02.1". Below the status bar are three buttons: "< Back", "Next >", and "Cancel". The "< Back" button is highlighted with a blue dashed border.

Figure 3: Enter a valid MobileMark 25 serial number to proceed with installation.

Figure 4 shows the default full installation of the benchmark. All core components, all scenarios and the results browser will be installed when the user clicks 'Next'.

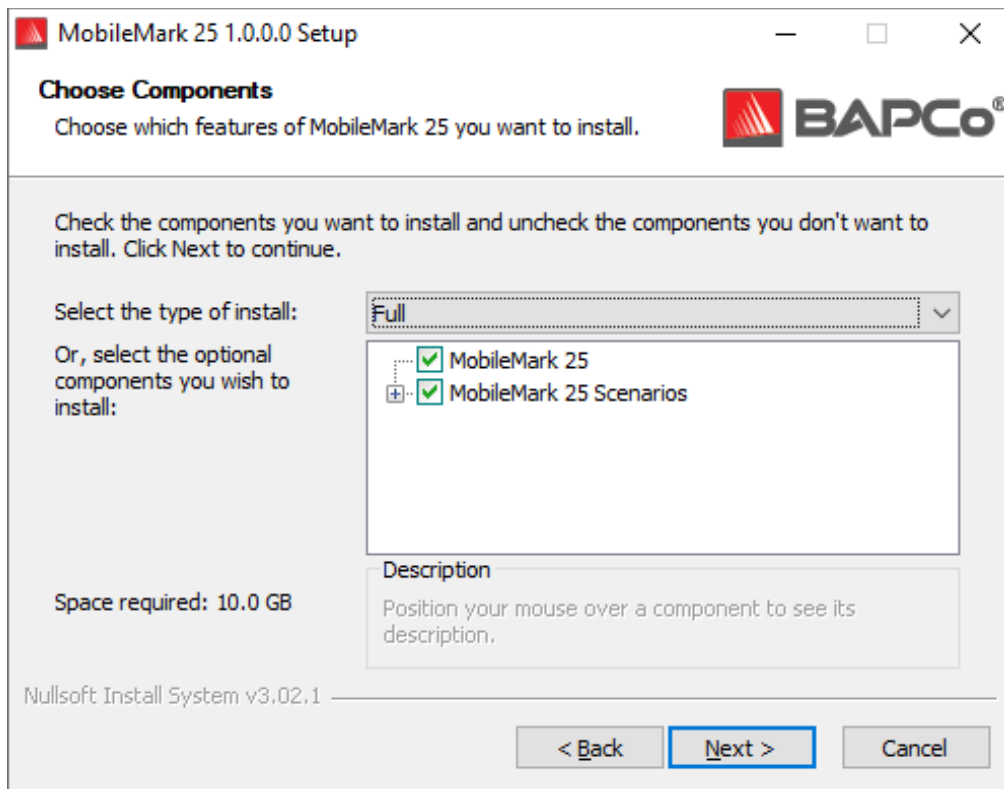


Figure 4: Default full install of MobileMark 25

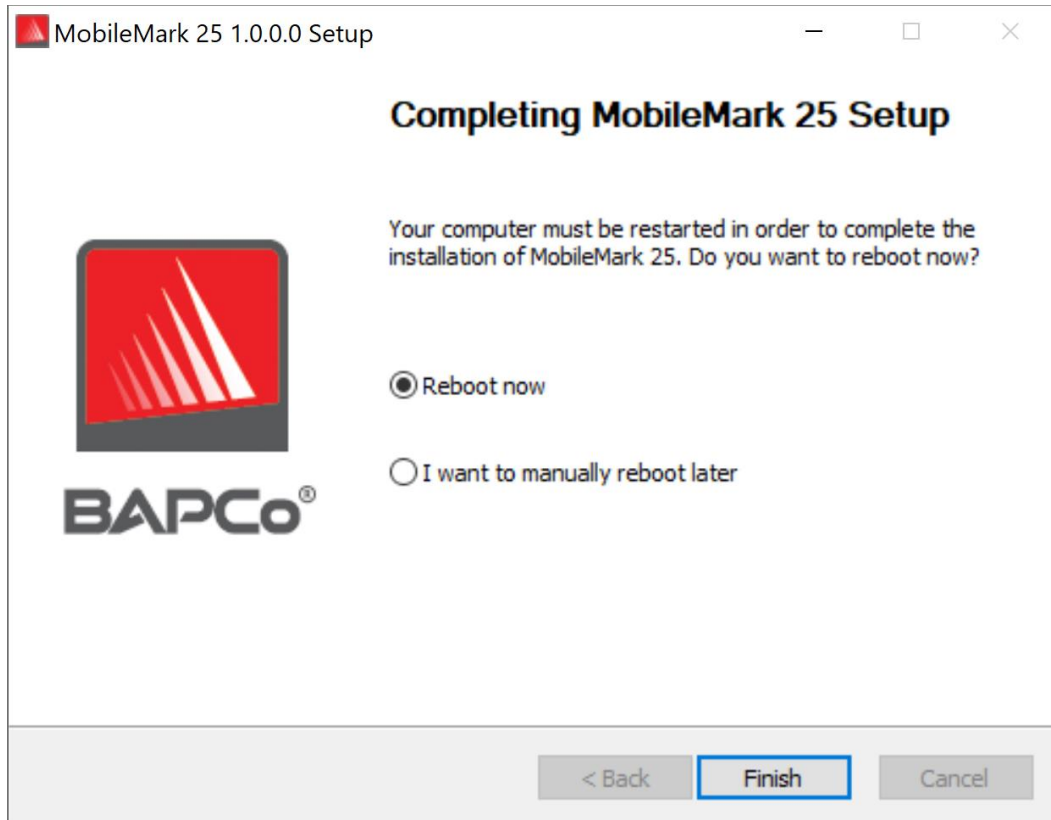


Figure 5: Installation of MobileMark 25 has completed successfully

Once installation has completed, please reboot the system before attempting to run MobileMark 25.

Uninstallation

MobileMark 25 can be uninstalled by navigating to the Programs and Features item in the Windows Control Panel. Choose the MobileMark 25 icon from the list of applications and select 'Uninstall'.

Due to DRM limitations of some of the applications in MobileMark 25, once the benchmark is uninstalled, it cannot be reinstalled back to the same system image.

Running MobileMark 25

Before launching a MobileMark 25 run, please verify the following:

- Battery is charged to 100%
- Wifi adapter is associated to a WLAN network, which is not Internet connected
- Screen brightness is set to maintain a minimum of 250 nits through the test. See the Benchmarking Rules section for information on how to properly set screen brightness
- Set volume to 50%
 - It may be necessary plug-in headset/speakers to keep audio driver active

Start MobileMark 25 by double clicking the desktop shortcut to launch the main interface as illustrated in Figure 6 below.

Important: If User Account Control has not been previously disabled, right-click the icon and choose 'Run as administrator'. UAC can then be disabled using the integrated configuration tool. More information on the integrated configuration tool is available in the [SYSTEM CONFIGURATION TOOL](#) section. MobileMark 25 must be run under the same user account that was used to install it.

Note: MobileMark 25 may also be launched via command line. See [AUTOMATED EXECUTION](#) section for more details.

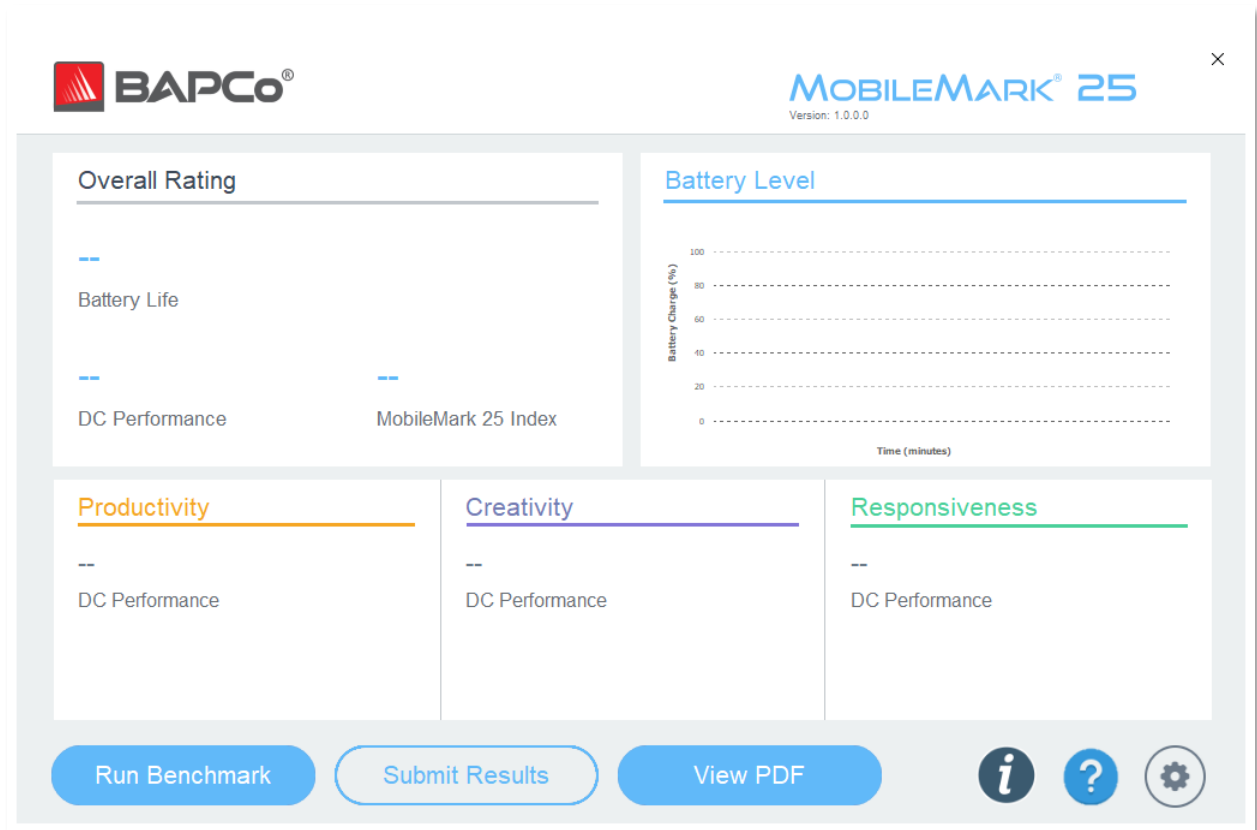


Figure 6: MobileMark 25 interface.

MobileMark 25 interface

MobileMark 25 includes a redesigned user interface, which is streamlined to simplify project configuration. Just click 'Run Benchmark' to launch a benchmark run with the default configuration, which will do the following:

- Run all three scenarios for each iteration, until battery is depleted.
 - The project name will be 'project001' for the first project. Subsequent projects will be named 'project002', 'project003', and so on.
- Conditioning run will be executed but will not be part of the performance score calculation.
- 'Process idle tasks' is set to OFF.
- The system configuration tool will execute with the following options:
 - Required items – set to ON
 - Recommended items – set to ON
 - Optional items – set to OFF

Windows 10 Performance/Power slider

The Windows 10 Performance/Power slider has four positions when the SUT is running on DC power (Best battery life, Better battery, Better performance, and Best performance) that can be used in MobileMark 25 testing. Notebook systems will automatically switch between different power profile configurations to

optimize for AC or DC power sources. Be sure that the SUT is configured with the desired settings on DC power before starting a run of MobileMark 25.

The Performance/Power slider is only available if the system under test is configured with the Balanced power plan, or a custom power plan was created using the Balanced power plan template.

Refer to the [MOBILEMARK 25 BENCHMARKING RULES](#) section for additional information about testing devices with the Performance/Power slider and Battery saver mode.

Steps for running in Better battery, Better performance, or Best performance:

- 1) Unplug the SUT from AC power.
- 2) Click on the battery icon in the systray to access the Performance/Power slider.
- 3) Select the desired slider position.
- 4) Reconnect AC power.
- 5) Verify the power slider position is set as desired by unplugging the SUT and clicking on the battery icon in the systray. The slider should be set to the position from step 3.
- 6) Reconnect AC power.
- 7) Launch MobileMark 25 GUI and click Run Benchmark.
- 8) Do not unplug the SUT until prompted by the benchmark.

Steps for running in Best battery:

- 1) Right click the start menu and select power options > battery.
- 2) Be sure the option 'Turn on battery saver automatically if my battery falls below:' is checked.
- 3) Set the battery saver threshold percentage to 100%.
- 4) Unplug the system from AC power.
- 5) Click the battery icon in the systray and verify the slider is set to 'Best battery life'.
- 6) Reconnect AC power.
- 7) Launch the MobileMark 25 GUI and click the settings icon to bring up the config tool.
- 8) On the Recommended tab, turn off the setting 'Verify Battery Saver Threshold'.
- 9) Go back to the main MobileMark 25 window and click the 'Run benchmark' button to start the test.
- 10) Do not unplug the SUT until prompted by the benchmark.

A single iteration of MobileMark 25 takes approximately 2 hours to complete. MobileMark 25 will loop through iterations until the battery charge is exhausted. Completion of the full battery run down will vary with system configuration options and battery capacity.

Results generation and display

The MobileMark 25 user interface will display the results of the most recently run project in the main benchmark windows. On first launch after new MobileMark 25 installation, results will not be displayed in the user interface until a run is completed.

MobileMark 25 scores

MobileMark 25 produces three main scores at the conclusion of a successful run. The SUT must complete at least one iteration of the MobileMark 25 workload to report scores. For additional details on MobileMark 25 scoring methodology, please refer to the MobileMark 25 whitepaper at www.bapco.com/products/mobilemark-25

Battery life

Battery life of the SUT is reported in hours and minutes. For best results, the SUT should begin the MobileMark 25 run down at 100% charge.

DC performance

The DC performance score is the relative performance rating of the SUT vs the MobileMark 25 reference system on DC (battery) power. The MobileMark 25 reference system scores 1000 for the DC performance rating, therefore a SUT with a 1500 DC performance rating is performing 50% faster than the reference systems.

MobileMark 25 Index

The MobileMark 25 Index score combines the Battery life score (in minutes) and the overall DC performance score into a single metric, showing the balance between battery life and performance. A higher value is better.

Results PDF document

MobileMark 25 saves the results from each run as a PDF document in the Results folder located on the desktop of the system under test. Use Google Chrome installed by MobileMark 25 to view the contents

of the PDF. Each PDF file also includes an embedded .XML attachment which contains additional details about the SUT, such as power scheme settings, driver information, etc. A standalone PDF reader such as Adobe Acrobat or Foxit PDF is required to view the XML, as PDF attachments are not currently supported in the browser-based PDF readers.

Results submission

There are two supported methods for submitting results to the [BAPCo Result Database](#):

Submit from MobileMark 25

- Click the 'Submit Results' button on the MobileMark 25 main window to submit the most recent FDR.
- Fill in the submission form dialog and click submit.
- Note: If no results are displayed in the main window, no information will be sent to BAPCo.

Submit results by web browser

PDF results files may also be submitted through the web browser via drag and drop at results.bapco.com/upload. To upload results by drag and drop, perform the following steps:

- Locate the PDF files to be submitted
- Navigate to results.bapco.com and click the 'Submit results' option in the menu on the left of the web page
- Complete the information (Name/company, email address, and configuration notes, if desired).
- Drag and drop the files on to the page, or click 'Add files' and browse to the folder containing the PDFs for upload. Click 'Start upload'.
- An email will be sent to the provided email address with a link to view the status of the submission. Results will take up to 10 days to be publicly viewable.

Automated installation

MobileMark 25 may be installed through the command line. The following command line switches are available:

- /S - silent install, no GUI
- /SN <serial number> - pass serial number to the installer

To install MobileMark 25 from the command line, open a command prompt, change to the directory where the MobileMark25_Setup.exe file is located and issue the following command, replacing <1234-5678-9123-4567-8912-34567> with the 25 digit serial number provided at time of purchase.

Example command for unattended installation

```
C:\>start /wait MobileMark25_Setup.exe /S /SN= <1234-5678-9123-4567-8912-34567>
```

Installer exit codes

When complete, the installer will return an exit code (stored in %ERRORLEVEL%). See below for the exit codes and their meanings:

- 0 - Success
- 3010 - Success, reboot required
- 1 - Installation abort by user
- 2 - General installation problem
- 3 - Missing or invalid serial number
- 4 - The following applications must be uninstalled before installing MobileMark 25
- 5 - MobileMark 25 (64-bit) can only be installed on 64-bit machines
- 6 - MobileMark 25 installer is already running
- 7 - Installer must be run from the setup file: MobileMark25_Setup.exe
- 9 - Application installation missing. Invalid installation. Please uninstall and reinstall MobileMark 25
- 10 - Installation directory must be less than 145 characters.

Automated execution

MobileMark 25 also supports execution from the command line. Supported command line parameters are provided in the list below. The MobileMark 25 GUI will launch if there are syntax errors in the command line text.

-p or --project <project_name>	Specifies the name of the project. This option determines if the GUI is presented to the user, or if the benchmark runs silently. If this option is supplied, it is assumed that the GUI should not appear.
-nc or --noconditioning	Turns off system conditioning run.
-ep or -- processIdleTask	Turns on process idle tasks.
-h or --help	Displays the help screen.
-v or --verbose	Turns on verbose mode.
-sc or --system config = <str>	Enables or disables system config tool options on the command line (see section SYSTEM CONFIGURATION FROM COMMAND LINE for more information)

The example command below will launch MobileMark 25 with the default system configuration items, create a project called 'test_project' and will turn on process idle tasks.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -ep
```

Automated data collection

MobileMark 25's workload manager allows the user to execute scripts to aid in the processing of results at the conclusion of a run. Placeholder scripts are included with each installation in the C:\Program Files (x86)\BAPCo\MobileMark25\Automation\ directory.

Unplug.bat is executed when MobileMark 25 prompts the user to unplug the system under test, prior to starting the battery run down.

ProcessResults.bat is executed at the conclusion of a successful run of MobileMark 25. Users can add commands to this script to copy results to a new location, or call additional commands specific to their environment.

ProcessError.bat is executed if MobileMark 25 exits with an error condition. Insert commands to this script to do things such as copying error logs to a new location, or call other commands for post processing of errors.

Benchmark settings

Users can access additional benchmark settings by clicking the settings button as indicated by the red arrow in Figure 7.

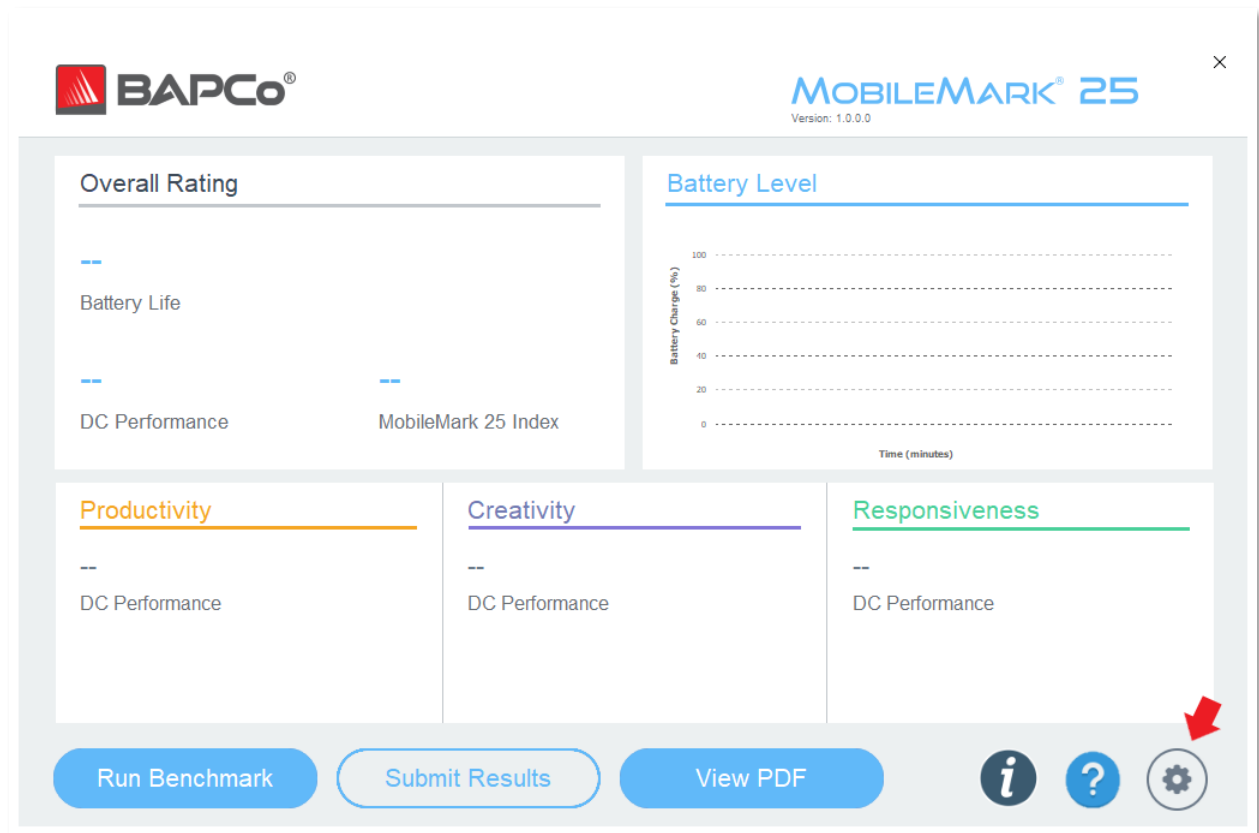


Figure 7: MobileMark 25 settings button

Clicking the 'Settings' button as indicated by the red arrow in Figure 7 above will bring up the detailed settings window as shown in Figure 8 below. From this window, users may change the default number of iterations, specify a project name, disable the conditioning run, disable the energy test, and make changes to the configuration tool options. See the next section, [SYSTEM CONFIGURATION TOOL](#), for more information.

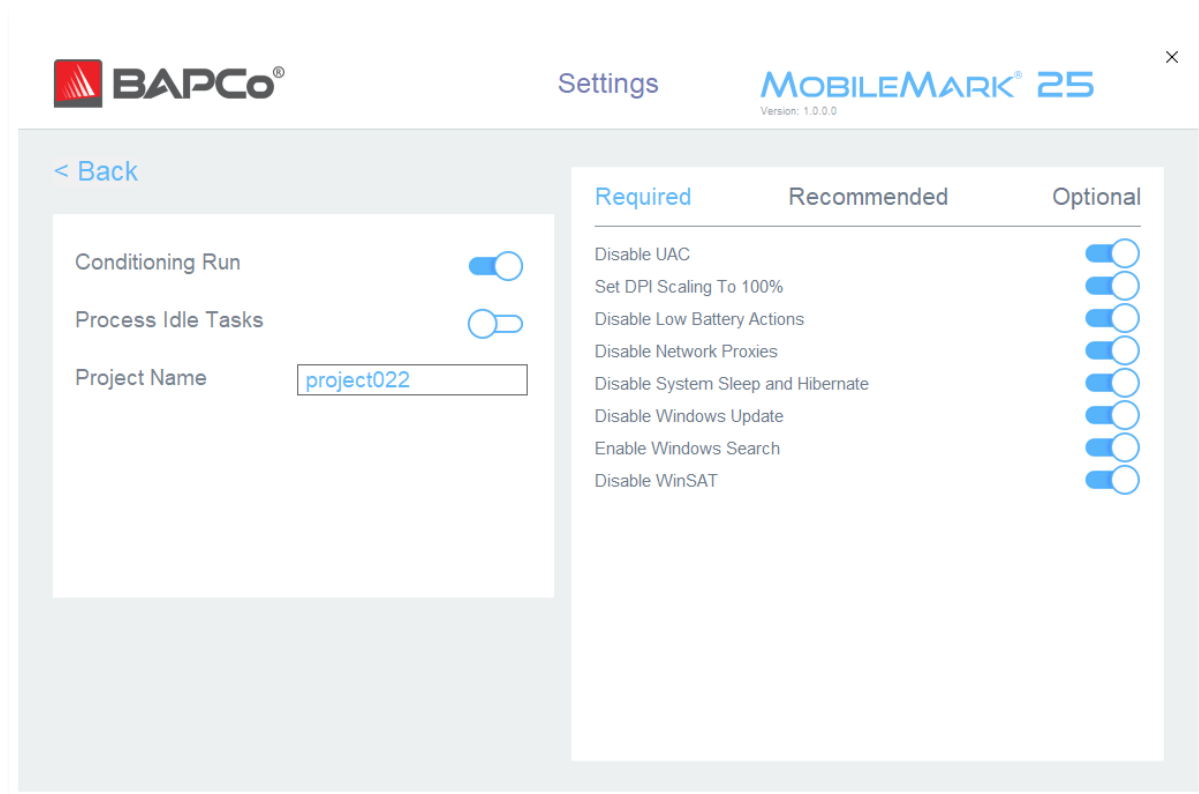


Figure 8: MobileMark 25 configuration options on Windows 10

System Configuration Tool

The configuration tool runs automatically at the start of each test, and records the state of each item on the system under test prior to modifying it for benchmark execution. At the conclusion of the run, each modified setting will be returned to its previous state.

By default, the configuration tool sets the Required and Recommended items as described below. Optional items are not set by default.

Users may modify the default items by clicking on the settings icon and navigating the Recommended or Optional configuration tabs. Note that Required settings cannot be disabled via the GUI.

If additional control of the system configuration items is required, please refer to the section [SYSTEM CONFIGURATION FROM COMMAND LINE](#).

The following is a list of configuration options with their priorities that can be applied using the System Configuration tool. Some items may apply only to certain supported operating systems, as noted in the item's description. An example command line string for each configuration item is also included in the description.

Required

Make configuration changes that are required for the benchmark to run. These items are enabled by default and cannot be disabled.

Disable User Account Control (UAC)

Disables User Account Control to prevent Administrator elevation prompts from appearing during benchmark runs. The system must be rebooted to apply this change.

Set DPI scaling to 100%

Sets the desktop scaling to 100%. Prevents failures on higher resolution displays.

Disable Low Battery Actions

Prevents the system from shutting down or from posting a warning when the battery reaches the low level.

Disable Network Proxies

Disables proxy server configuration for Internet connection settings.

Disable System Sleep and Hibernate

Prevents the system from going to sleep or hibernating and disables the "Require password on wake" setting.

Disable Windows Update

Disables the Windows Update service.

Enable Windows Search

Makes sure that the Windows Search service is enabled and running.

Disable WinSAT

Disables the WinSAT scheduled task

Recommended

Make configuration changes that are recommended in order to obtain repeatable scores, and minimize the occurrence of errors. Recommended items are enabled by default. Recommended items may be disabled by clicking the slider next to the configuration item or using the command line option.

Create BAPCo Power Scheme

Creates a new power scheme named "BAPCo MobileMark 25" based on the system's currently active power scheme. If applied, all subsequent power profile configuration changes are applied to the newly created power scheme. If this option is not enabled, all power profile configuration changes are applied to the currently active power scheme.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
PowerScheme= on|off"
```

Set Power Plan Type to "Balanced"

Sets the "Power Plan Type" option (sometimes referred to as "Power Plan Personality") of the active power scheme to "Balanced". This setting tags the active power plan with an overall personality that favors energy savings. Drivers and applications may query this setting to determine their respective performance vs energy savings behavior. This option may be used whether or not the "Create BAPCo Power Scheme" option is checked. If "Create BAPCo Power Scheme" is not enabled, "Set Power Plan Type" will be applied to the currently active power scheme.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc= PowerPlan=
on|off"
```

Set CPU Adaptive Mode

Sets the minimum CPU performance state to 5% and the maximum value for CPU performance state to 100% on both AC and DC power.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
SetCPUAdaptiveMode= on|off"
```

Disable Battery Saver Dimming

Disables screen dimming when Battery Saver is engaged.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
DisableBatterySaverDimming= on|off"
```

Verify Battery Saver Threshold

Sets the battery saver threshold to less than or equal to 20%. Leave this option on unless testing with Windows 10 Performance/Power slider in the 'Best Battery' position. [REFER TO THE WINDOWS 10 PERFORMANCE/POWER SLIDER](#) section for more information.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
VerifyBatterySaverThreshold= on|off"
```

Disable Disk Defrag

Disables the Defrag scheduled task.

"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc= DiskDefrag=
on|off"

Disable Windows Error reporting

Prevents the Windows Error reporting tool from presenting error reporting windows.

"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
ErrorReporting= on|off"

Disable Windows Lock screen

Disables the lock screen to prevent it from blocking application input.

"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
DisableLockScreen= on|off"

Disable Screen Saver and Monitor Timeout

Turns off the screen saver. Disables display timeout in the power profile for both AC and DC options.

"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc= ScreenSaver=
on|off"

Set Font Smoothing

Turns on Windows font smoothing.

"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
SetFontSmoothing= on|off"

Disable Windows Security Center

Attempts to disable Windows Security Center, if the version of Windows allows it to be disabled. If Windows Security Center cannot be disabled, no change will be made for this item. Status of Windows Security Center will be reported in the FDR.

"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
WindowsSecurityCenter= on|off"

Optional

Make configuration changes that are typically not needed to obtain repeatable scores, but which may be needed in some rare cases. Optional items are not enabled by default.

Disable Hard Disk Timeout

Prevents the hard disk from going to sleep.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
HardDiskTimeout= on|off
```

Disable System Restore

Disables Windows system restore.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
SystemRestore= on|off"
```

Ignore Laptop Lid Close

Prevents the system from going to sleep if the lid is closed during a benchmark run.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
LaptopLidClose= on|off
```

Enable Dark Mode

Follows the system setting by default. If Dark mode is not turned on, setting this item to 'on' will enable Dark mode for the subsequent run.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
EnableDarkMode= on|off
```

No Wait for OpenMP Threads

Disables wait time between OpenMP threads. May improve performance for systems.

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
ZeroKMPBlockTime= on|off
```

System configuration from command line

When running MobileMark 25 from the command line, the system configuration items will be set according to their defaults unless the user specifies options on the command line.

Example:

```
"C:\Program Files (x86)\BAPCo\MobileMark25\bin\MobileMark 25.exe" -p test_project -sc=
PowerScheme= Off"
```

The above command will execute the benchmark in a project called 'test_project' and run the defaults of one iteration plus the conditioning run. The 'Create BAPCo Power Scheme' option in the configuration

tool will be set to 'Off'. MobileMark 25 will not create the BAPCo Power scheme before modifying the system configuration for the test.

For cases where users do not want to set any system configuration items, all the system configuration items must be specified as set to 'Off' on the command line.

The Recommended and Optional config tool items can be toggled with “--sc all=On|Off”, which will allow the user to disable all the system configuration options without having to specify each item on the command line. Configuration items listed as Required cannot be disabled.

Benchmark Usage

This subsection describes the behavior of MobileMark 25 during the execution of a benchmark run.

Best Practices

In order to obtain reliable, reproducible results, BAPCo recommends using the default settings in the MobileMark 25 interface. To run with the default settings, just launch MobileMark 25 and click 'Run Benchmark'.

- Conditioning run enabled
- Process idle tasks disabled
- Performance slider set to 'Best performance' while on DC power
 - Changes to the performance slider must be made while on DC power. Configuring the slider on AC power will not change the setting for DC power.
- Display brightness must be set to 250 nits on DC power. See the [BENCHMARKING RULES](#) section for additional details.
- When using BAPCo benchmarks to evaluate performance or battery life, one should install the latest production drivers from the hardware manufacturer. Drivers included with the operating system may not be device specific or newer drivers may be available from the device manufacturer. Using incorrect drivers could result in significantly reduced performance

Heads Up Display (HUD)

The Heads Up Display appears in the upper right corner of the desktop and provides information about the currently running project.

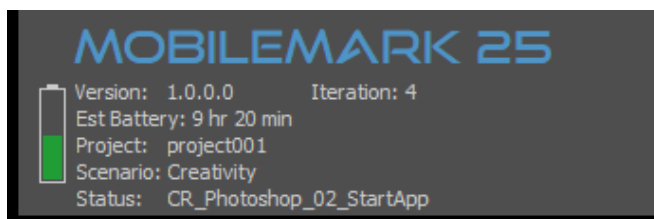


Figure 9: MobileMark 25 Heads Up Display

- Version: Displays the MobileMark 25 version number (major.minor.patch.build).
- Est Perf: The estimated DC performance score appears after one completed iteration.
- Est Battery: Estimated battery life (in minutes) appears after one completed iteration.
 - Note that battery run down is not linear, please complete a full run down for most accurate results
- Project: The project name of the current test.

- Scenario: The name of the currently running scenario
- Status: The name of the currently running script

Process idle tasks

Prior to executing benchmark workloads, the MobileMark 25 workload manager will pause for 120 seconds to allow the system to stabilize. When the 120 seconds have elapsed, the workload manager will issue the process idle tasks command, if this option was selected. When the idle tasks queue is cleared, the benchmark workload will begin. Note: Process idle tasks completion time can vary from system to system.

Keyboard/mouse input blocking

Once workload execution begins, the workload manager will lock the system to prevent accidental input from the mouse or keyboard from disrupting the workload automation. The workload manager will continue to execute the selected scenarios for the current project and will display the results at the successful conclusion of the run. Refer to the [STOPPING A RUN IN PROGRESS](#) section below for additional information on keyboard and mouse input blocking.

Error handling

By default, when MobileMark 25 encounters an error during the execution of a project, the workload manager will log the error and then reboot the system as long as there is still charge remaining.

Advanced troubleshooting

MobileMark 25 offers an advanced troubleshooting option with the BENCHMARK_TIMEOUT_MULT environment variable. This variable increases the amount of time a benchmark script waits before throwing an error and either attempting a retry or halting the run. The default value for BENCHMARK_TIMEOUT_MULT is 1.0. Increasing the value to 2.0 doubles the error handling timeout, 3.0 triples the timeout, and so on. Try increasing this value if the SUT experiencing errors due to a lower performing HW configuration (HDD vs SSD, less system RAM installed) or if errors are occurring during low remaining battery charge.

Stopping a run in progress

If it becomes necessary to stop a benchmark run in progress, follow these steps:

1. Press the CTRL-ALT-DEL keys at the same time to bring up the Windows change password screen.
2. Click 'Cancel' to return to the desktop.

3. Keyboard and mouse input should now be enabled.
4. Navigate to the systray in the lower right corner of the screen and find the BAPCo icon, as shown below.
5. Right click the icon and choose 'Stop'.



Figure 10: BAPCo systray icon. The green triangle indicates MobileMark 25 is running.

Reference system

MobileMark 25 performance scores are normalized using a reference system. The reference system scores '1000' for DC performance on each scenario and '1000' on the overall MobileMark 25 DC performance score. The MobileMark 25 Index score for the reference system is 580. The battery life of the system under test is reported in hours and minutes.

Dell® Latitude™ 5420

- CPU: Intel Core™ i5-1145G7 processor @ 2.60 GHz
- Graphics: Intel Iris XE
- Resolution: 1920x1080 non touch
- Display Brightness: 250 nits
- OS build version: Windows 10 (20H2) build 10.0.19042.508 (64 bit)
- RAM: 2 x 16 GB (Dual Channel) DDR 3200 non ECC
- Storage: 256 GB Solid State Drive, PCIe-NVMe OPAL2.0 M.2

Applications

MobileMark 25 installs and/or uses the following applications. Some applications appear in multiple scenarios, but only one instance of the application is installed. BAPCo recommends users start with a clean installation Windows 10, or remove

Productivity

- Adobe® Acrobat® Pro DC (15.010.20060)
- Audacity (2.3.2)
- Corel WinZip 24.0 Enterprise
- Google Chrome™ (90.0.4430.212)
- Microsoft Excel® 2019 Professional Plus VL
- Microsoft Outlook® 2019 Professional Plus VL
- Microsoft PowerPoint® 2019 Professional Plus VL
- Microsoft Word® 2019 Professional Plus VL
- Shotcut (19.09.14)

Creativity

- Adobe Lightroom® Classic CC (10.0)
- Adobe Photoshop® CC (22.0)
- Adobe Premiere® Pro CC (14.5.0)

Responsiveness*

- Adobe Acrobat Pro DC (15.010.20060)
- Adobe Lightroom Classic CC (10.0)
- Adobe Photoshop CC (22.0)
- Adobe Premiere Pro CC (14.5.0)
- Audacity (2.3.2)
- Corel WinZip 24.0 Enterprise
- Google Chrome™ (90.0.4430.212)
- Microsoft Excel 2019 Professional Plus VL
- Microsoft Outlook 2019 Professional Plus VL
- Microsoft PowerPoint® 2019 Professional Plus VL
- Microsoft Word 2019 Professional Plus VL
- Shotcut (19.09.14)

Please note some of these applications have licensing restrictions which cause them to expire after 30 days requiring a full-restore of the system under test from backup and then installing new instance of MobileMark 25.

*The Responsiveness scenario is a combination of operations taken from the Productivity and Creativity scenarios

Scenarios

MobileMark 25 scenarios and workload descriptions are below.

Productivity

The Productivity scenario models productivity usage including word processing (mail merge, document comparison, and PDF conversion), spreadsheet data manipulation (data modeling, financial forecasting), email creation/management, presentation editing, application installation, web browsing, archiving files, and video playback.

Creativity

The Creativity scenario models editing digital photos (creating HDR), cataloging digital photos (organizing catalog, use of facial detection to group people), and editing digital video (create a timeline from various source clips and transcode the output).

Responsiveness

The Responsiveness scenario is a combination of operations taken from the Productivity and Creativity scenarios. Such operations include application opens, file opens, file saves, and more. Please refer to the MobileMark 25 Whitepaper for more information on the MobileMark 25 scoring methodology.

Support

Technical support for MobileMark 25 is provided on the web at <https://bapco.com/support> and via email at support@bapco.com.

MobileMark 25 Minimum system requirements:

- System running on DC battery power
- **CPU:**– CPU: 2015 or newer x86 processor (Intel 6th Generation Core or AMD 7000 series APU)
- **RAM:** 8 GB
- **HDD/SSD:** 25 GB of free space on the primary drive
- **Operating System:** Microsoft® Windows® 10 64-bit version 19H2 or higher
- **Resolution:** 1280x800 or 1366x768, 2gb of VRAM
- **Graphics:** DirectX 12 compatible
- **Network:** Associate to Wi-Fi network

Results run on systems that do not meet the minimum requirements are valid for publication, however BAPCo will not be able to offer technical support for those configurations.

When contacting support please include the following information.

- MobileMark 25 version, e.g. 1.0.0.123
- System configuration information
- Step by step instructions for reproducing the problem
- Rate of error, e.g. 100%, 50%
- Archive of the benchmark error logs from the failing run
 - Locate the installation folder, for example: C:\Program Files (x86)\BAPCo\MobileMark25\Config
 - Copy the MobileMark25.db file
 - If reporting a problem with installation, locate the benchmark installation logs:
 - %TEMP%\MobileMark25_Disc1.log
 - Archive the database file and the logs listed above using WinZip, WinRAR, etc.
 - Attach the archive file to the support request email sent to BAPCo support, or please upload the archive file through the form at <https://bapco.com/support>
 - When reporting multiple errors, please include a description for each problem being reported

MobileMark 25 Benchmarking Rules v1.0

This document describes the rules governing publication of results derived from running the BAPCo MobileMark 25 benchmark. Any licensee who wishes to publish such results is obliged to adhere to all rules and regulations described in this document or other documents provided by BAPCo related to execution and reporting of MobileMark 25 benchmark results. BAPCo reserves the right to change the rules outlined in this document at any time. Licensees are encouraged to consult BAPCo website at www.bapco.com for the latest information regarding execution and publication rules. For more information please consult the Software License Agreement.

Benchmark Execution

Workload Manager

All benchmarks must be run using the MobileMark 25 Workload Manager. This utility is an executable program that runs the MobileMark 25 benchmark. It also includes a module that generates the final benchmark results for the system under test. All published results must be derived only from a complete and correct run of the benchmark. All tests must be performed without modification to any part of the MobileMark 25 software.

The collective set of hardware and software used in generation of an official MobileMark 25 result must be available to the public as defined by BAPCo's availability criteria. The following specific rules apply:

Operating System

The operating system used to generate and publish results must be a publicly available release from the original software vendor. Consult the product manual at www.bapco.com for the current list of supported operating systems. Upgrade of specific drivers that are released and maintained by vendors other than the operating system vendor (e.g. graphics drivers, disk drivers, motherboard setting files, multimedia drivers) is allowed provided these drivers are publicly available, release-quality drivers from original vendors of such drivers. Licensees may also use operating system service packs, API updates (e.g. Direct X) and other such updates provided they are publicly available, release-quality software from the original vendor, and that they meet the benchmark's Operating System requirements. Licensees should also consult license agreements from individual software vendors to ensure compliance with vendor benchmark restrictions.

System Configuration

To ensure the integrity of MobileMark 25 results, test systems must maintain the same hardware configuration and software settings throughout the execution of the test. Any modification to hardware configuration and/or software settings will invalidate the results

Hardware

The system hardware used to generate official MobileMark 25 results must be publicly available at the time of publication or within 60 days thereafter. The system must be purchasable as a complete platform from an Original Equipment Manufacturer within 60 days of publication. Alternatively, licensees may report results for systems which may not be available from an OEM but whose individual components are publicly available and purchasable from various vendors at the time of publication or within 60 days thereafter. Note that the 60-day grace period does not apply to system software. All software used must be publicly available and be of release-quality available from the original software vendor.

Software

OEM software used to generate official MobileMark 25 results has no grace period, and therefore must be release quality and publicly available from the original vendor immediately upon publication of results.

Performance or Battery Life Enhancements

Use of performance or battery life enhancements such as using a software utility or other technique is allowed under the following conditions. Any performance or battery life enhancing software must be a release-quality, publicly available offering from the original vendor(s). Any performance or battery life enhancing techniques must be accessible to the public at large. Use of either method must be documented and included with the FDR submission. Performance or battery life enhancing techniques must not compromise the integrity of the system under test or the MobileMark 25 software. The use of drivers or other software specifically optimized for the purpose of increasing MobileMark 25 battery life or performance qualification scores is expressly prohibited. BAPCo shall reserve the right to review the usage of such tools or techniques and invalidate submitted results at its sole discretion.

Wireless Connectivity

MobileMark 25 requires that the system's wireless network adapter be turned on and associated with a wireless network for the duration of the test. MobileMark 25 now supports running while connected to the Internet, but if issues occur, please disconnect from the Internet and try again.

Screen Brightness

The test system display brightness must be set to a minimum brightness of 250 cd/m2 (nits) for LCD backlit display panel or comparable Perceptual Contrast Length (PCL) value as determined via the MobileMark25 screen Brightness Profiler wizard for valid FDR submission. This screen brightness setting must be

maintained for the duration of the test, except when “Screen off” or “Modern Standby” is in use (see below). Screen dimming, ambient light sensing or use of any other technology to alter the screen brightness during the test is not allowed unless specifically supported by the benchmark.

The new screen Brightness Profiler wizard helps guide the user through the process of setting the SUT screen brightness while on DC (battery) power, and includes the following:

- Display warm-up, as needed.
- Display of black and white checkerboard test pattern, with optional overlay for probe position.
- Adjustment of screen brightness to have comparable Perceptual Contrast Length (PCL) to 250 cd/m² LCD backlit display panels, with a worse case limit of 250 cd/m².
- Systems not capable of reaching the specified brightness must be documented as part of any FDR submission, and must run at maximum brightness setting.

Refer to the Brightness Profiler user guide at www.bapco.com/products/mobilemark-25 for more information.

Screen Off

Use of operating system supported screen off capability is allowed provided that:

- Screen off timeout value must be set to a minimum of 5 minutes on DC power.
- Screen off only occurs during idle periods of the benchmark, only after the point in each idle period where 5 minutes of idle has elapsed.

Modern Standby

Use of operating system supported Modern Standby is allowed at the tester’s discretion provided that:

- Screen off timeout value must be set to a minimum of 5 minutes on DC power
- Modern standby only occurs during idle periods of the benchmark, only after the point in each idle period where 5 minutes of idle has elapsed.
- The test system meets the requirements of the Microsoft Modern Standby specification: <https://docs.microsoft.com/en-us/windows-hardware/design/device-experiences/modern-standby>
- Standby/Hibernate: Use of operating system supported standby/hibernate capability is NOT allowed, with the exception of Modern Standby when used in accordance with the rules above.

Windows 10 Performance/Power Slider and Battery Saver Mode

The Windows 10 Performance/Power slider may be used to configure the system under test, provided that the slider position remains the same for the duration of the test. For slider positions “Better Battery”, “Better Performance” and “Best Performance”, the Battery Saver threshold must not exceed 20%, and the setting “Lower screen brightness while in battery saver” must be unchecked. When using the “Best Battery” position for slider testing, the Battery Saver threshold must be set to 100% so that battery saver remains in effect throughout the test. The setting for “Lower screen brightness while in battery saver” must be unchecked. Refer to the MobileMark 25 user guide ‘Windows 10 Performance/Power slider’ section for details on how to configure the slider for “Best Battery”.

Full Disclosure Report

A complete Full Disclosure Report (FDR), must be generated by the Workload Manager for all published results. This FDR must include the MobileMark 25 battery life rating and the performance qualification, as well as the performance scores for each of the three scenarios. Additional information about the configuration of the system under test must also be included in the FDR. The format and the information included in this report is determined by BAPCo. No modifications should be made to the FDR (modifications to the FDR will invalidate the FDR).

Publication of results

BAPCo requires all licensees to submit FDRs to the BAPCo website (<https://results.bapco.com>) for all publicly available published results. Results may be submitted by any of the following methods:

- 1) Clicking the ‘submit results’ button from inside the benchmark GUI after a completed run
- 2) Uploading results via the online submission form at <https://results.bapco.com>

Or, if the above options are not available

- 3) Results may be submitted by email to report@bapco.com

Licensees are responsible for retaining FDR records for all published results. Results submitted by email will also be published at results.bapco.com.

All FDRs submitted by licensees to BAPCo are subject to a 10 working day review period. During this review period any BAPCo member can challenge the submitted FDR or submit a counter FDR. When a challenge occurs or a counter FDR is submitted, BAPCo will decide which, if any, of the FDRs will be accepted for inclusion in the FDR database.

Any publication of results must be accompanied by at least the system model number plus any discrepancies between the shipping configuration of that system model and the configuration of the system model actually tested.

Results collected on systems that do not meet the minimum system requirements for running MobileMark 25 may be published if submitted to BAPCo for inclusion in the FDR database. However, BAPCo will only offer technical support for system configurations that meet or exceed the minimum system requirements for MobileMark 25.

Any publication of MobileMark 25 results must include the MobileMark 25 Battery Life score, the MobileMark 25 Overall DC Performance score, and the MobileMark 25 Index score from the same run.

Any publication of MobileMark 25 results must include a link to the matching result in the online results database at results.bapco.com.

Relative Performance

Licensees have the option of publishing the relative performance (and battery life) of two or more systems (for example, “System X is 15% faster than System Y using MobileMark 25”) as long as the licensee adheres to the Benchmark Execution and Publication rules above for all systems.

If a licensee publishes the relative performance of two or more systems and one or more of those systems does not adhere to the Benchmark Execution and Publication rules above, the licensee must state that the performance results are “estimated” or “projected” when making the claim (for example, “We estimate that System X is 15% faster than System Y using MobileMark 25”). Publishing absolute scores of estimated or projected results is not permitted.

Availability

When publishing MobileMark 25 results, the tested system must be available for purchase by the public either at the time of publication or within 60 days after publication. Note that the 60-day grace period does not apply to system software. All software used must be release-quality and made publicly available from the original software vendor.

FDR Processing

The submitted FDRs are processed by BAPCo and classified as:

Released for publication - The results are released for publication as filed.

Rejected - The results are rejected for publication as filed.

The Released for publication classification is in no way a validation or an endorsement of the results by BAPCo. Licensees are free to publish results as long as a complete and valid FDR has been generated and submitted to results.bapco.com. BAPCo will perform frequent audits of the submitted FDRs and reserves the right to revoke the license granted to licensees who have not adhered to the regulations described in this or other MobileMark 25 documentation. In the case where an FDR is returned to the licensee with rejected classification, the licensee must immediately stop publication of the rejected results until the matter is clarified by BAPCo. Any publication of results must be accompanied by at least the system model number plus any discrepancies between the configuration of the stated model number and the configuration of the system tested. Any publication of MobileMark 25 results must include the MobileMark 25 Battery Life score, the MobileMark 25 Overall DC Performance score, and the MobileMark

25 Index score from the same run. The term MobileMark is a registered trademark of the Business Applications Performance Corporation and may only be used in conjunction with performance metrics generated by the MobileMark 25 Workload Manager. Any other performance characterizations may be made but must be derived from the performance metrics generated by the Workload Manager. The terms MobileMark and MobileMark 25 may not be used as the performance metric describing such characterizations.

Publication of Results on Non-OEM Platforms

BAPCo accepts FDR submissions and allows the publication of performance qualified battery life indices when using MobileMark 25 for making "Non-OEM" platform comparisons. This includes performance-qualified battery life comparisons on systems that are not shipped from an OEM as a complete platform. An example of such comparisons would be swapping to a different hard disk or changing the amount of RAM in the test system and demonstrating the impact on the benchmark results. Results submitted to BAPCo or published on Non-OEM platforms must be marked as Modified on the accompanying FDR submission and whenever appearing in publications of any kind. Any publication of MobileMark 25 results must include the MobileMark 25 Battery Life score and MobileMark 25 Overall Performance Qualification score from the same run.