

PassMark® White Paper

Using BurnInTest on a system with no Operating System – WinPE 3.0



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Overview

Many BurnInTest users can benefit from testing PC hardware when there is no Operating System installed, or the Operating System is inoperable. This can be useful for testing PC hardware:

1. In a production line environment,
2. That is to be shipped with Linux,
3. In a known virus free environment and
4. To try to determine the cause of corruption of an Operating System.

This document aims to assist people in setting up an environment that allows PassMark BurnInTest to be used in these situations.

This paper is applicable to the Windows Professional edition of BurnInTest v7.0. This version of BurnInTest requires Microsoft Windows in order to run. To run BurnInTest on a system without an operating system you need to set up a "Pre-install environment" that allows Microsoft Windows to be booted from a CD/DVD, USB Flash Drive or via PXE (Preboot eXecution Environment). This document describes setting up a Microsoft Windows Pre-install environment (WinPE) environment that includes both Windows and BurnInTest V7.0 on a bootable CD/DVD or bootable USB Flash Drive (UFD). The document also describes how to inject new device drivers into the Windows image for updated hardware.

This document does not intend to cover product licensing issues and it is up to the reader to review this. The names of actual companies and products mentioned herein may be the trademarks of their respective owners.

Thanks to one of our many BurnInTest User's, Tripredacus, for his documentation on the WinPE installation process with BurnInTest.

Audience

This paper is targeted at companies and individuals that need to run BurnInTest on a system without a working or installed Operating system. It is aimed at people with technical PC knowledge.

Standard Environment

The standard environment described in this document is:

- WinPE 3.0.
- BurnInTest PRO v7.0 (or higher).
- Hardware including at least 512MB of RAM (32-bit WinPE) or 1GB (64-bit WinPE).

Limitations

This guide is designed to allow BurnInTest to be run from a Windows PE 3.0 environment. It does not cover the differences of PE v2.x or PE v1.x (Windows XP - 2003 / BartPE).

Currently, we plan to support the following BurnInTest tests under the above standard environment:

- CPU;
- RAM;
- Disk (disk volumes only);
- Optical disk (read tests);
- Network (Standard);
- USB (using the Passmark USB 2.0 Loopback plugs);
- Parallel Port ;
- Serial port;
- Plugin (BurnInTest plugins).

Currently we do not plan to support the following tests under WinPE (feedback from users with their experience, may influence this list):

- Video Playback;
- Sound;
- 2D;
- 3D;
- Printer;
- Tape.

Please note that we have intentionally not restricted any of the BurnInTest tests in software, as I am sure there are WinPE users that have or will get these tests working under WinPE. Send us an email.

Some system information normally displayed by BurnInTest will not be available under WinPE, this includes (but may not be limited to) the Graphics card, HDD model and USB controller/device information.

This guide also does not enable networking, and uses the WINPESHL.INI method to launch the program.

Windows PE 3.0 can be obtained with the Microsoft Windows Automated Installation Kit (WAIK) or from the Microsoft OEM Preinstall Kit (OPK) Tools. There are differences with the capabilities of the PE in each of these versions, but these differences have no impact on this guide.

This guide is written using the OPK Tools and WAIK. It will also make x86 and x64 versions, and you need to use drivers suitable to your build. It is recommended that you track which drivers you end up putting into your PE. You will only need to install drivers for NIC and non-standard Mass Storage Controllers, such as RAID cards. This guide was prepared and tested on a Windows 7 Ultimate workstation.

Note that in our testing the 32-bit version of BurnInTest will not run in a 64-bit WinPE environment – use the 64-bit version of BurnInTest in this scenario.

You will need to run the tools with (elevated) Administrator privileges.

Downloads

Microsoft Windows Automated Installation Kit (WAIK) can be downloaded here:

<http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=5753>

Microsoft OEM Preinstall Kit (OPK) can be downloaded here (you will need to be a registered Microsoft OEM and have an account with Microsoft): <http://www.microsoft.com/oem/sblicense/OPK/default.msp>
or

<http://oem.microsoft.com/script/contentpage.aspx?PageID=501924>

Microsoft devcon utility (for installing serial port and parallel port device drivers in WinPE):

<http://support.microsoft.com/kb/311272>

The latest version of the BurnInTest PRO can be downloaded here:

http://passmark.com/download/bit_download.htm

Building a Preinstall Environment

This section describes how to build a WinPE 3.0 boot CD or DVD with BurnInTest V7.0.

This is a final walkthrough to create a functional PE image that will automatically load BIT upon opening. You need to install the WAIK/OPK Tools first (as well as BIT) before you should start. Also make sure to have your drivers ready. All commands are done by using the WAIK or OPK "*Deployment tools Command Prompt*", which is a special paths CMD that will appear in the Start menu after you install that tool.

If you are running Windows 7, you will need to launch "*Deployment tools Command Prompt*" with elevated administrator privileges.

i.e. Start ... All Programs ... Microsoft Windows AIK ... Deployment Tools Command Prompt (Right mouse click and select 'Run as administrator').

Note: The 'x86' text in the DISM commands below refers to a 32bit WinPE build. If you intend to create a 64bit WinPE build, then you will need to substitute the 'x86' text with 'amd64' in the DISM commands below (also refer to "**Example WinPE build**" later in this document).

1. Create the base PE source.

The destination folder cannot already exist.

```
copyype x86 c:\bitpe
```

2. Mount the WinPE source

Extract the base image winpe.wim to a local directory:

```
DISM /Mount-wim /WimFile:c:\bitpe\winpe.wim /index:1 /MountDir:c:\bitpe\mount
```

Note: After mounting the base image, you can use the "DISM /Get-Packages" command to see which packages are installed and available for installation.

For example, `DISM /image:c:\bitpe\mount\ /Get-Packages`

3. Install the packages that are needed.

```
DISM /image:c:\bitpe\mount /Add-Package /PackagePath:"C:\Program Files\Windows AIK\Tools\PETools\x86\WinPE_FPs\winpe-wmi.cab"
```

```
DISM /image:c:\bitpe\mount /Add-Package /PackagePath:"C:\Program Files\Windows AIK\Tools\PETools\x86\WinPE_FPs\winpe-hta.cab"
```

```
DISM /image:c:\bitpe\mount /Add-Package /PackagePath:"C:\Program Files\Windows AIK\Tools\PETools\x86\WinPE_FPs\winpe-scripting.cab"
```

The packages available are as listed in the Microsoft WinPE documentation. An extract follows:

Package Name	Description
WinPE-FONTSupport- <region>	Additional font support for the following languages: ja-JP, ko-KR, zh-CN, zh-HK, and zh-TW.
WinPE-HTA	HTML Application support. Enables the creation of GUI applications using the Windows Internet Explorer® script engine and HTML services.
Winpe-LegacySetup	The Media Setup feature package. All Setup files from the \Sources folder on the Windows media. Add this package when servicing Setup or the \Sources folder on the Windows media. Must be added with the Setup feature package. To add a new Boot.wim to the media, add either child package in addition to the Setup and Media packages. This package is required to support Windows Server® 2008 R2 installation.
WinPE-MDAC	Microsoft® Data Access Component support. Enables queries to SQL servers with Active Directory Objects (ADO). Example usage: building a dynamic Unattend from unique system information.
WinPE-PPPoE	Enables Point-to-Point Protocol over Ethernet (PPPoE) support. Create, connect, disconnect and delete PPPoE connections from Windows PE.
WinPE-Scripting	Windows Script Host (WSH) support. Enables batch file processing using WSH script objects.
WinPE-Setup	The Setup feature package (parent). All Setup files from the \Sources folder common to Client and Server.
WinPE-Setup-Client	The Client Setup feature package (child). The Client branding files for Setup. Must be added after the Setup feature package.
WinPE-Setup-Server	The Server Setup feature package (child). The Server branding files for Setup. Must be added after the Setup feature package.
WinPE-SRT	The Windows Recovery Environment feature package. Provides a recovery platform for automatic system diagnosis and repair and the creation of custom recovery solutions.
WinPE-WMI	Windows Management Instrumentation (WMI) support. A subset of the WMI providers that enables minimal system diagnostics.
WinPE-WDS-Tools	The Windows Deployment Services tools feature package. Includes APIs to enable a multicast scenario with a custom Windows Deployment Services client and Image Capture utility.

4. Install the required device drivers

Place the NIC and Mass Storage driver files that you need into the c:\bitpe\drivers\nic and c:\bitpe\drivers\hddc directory paths and then install.

```
DISM /image:c:\bitpe\mount\ /Add-Driver /driver:c:\bitpe\drivers\nic /recurse /ForceUnsigned
```

```
DISM /image:c:\bitpe\mount\ /Add-Driver /driver:c:\bitpe\drivers\hddc /recurse /ForceUnsigned
```

Note: By including the /recurse switch you tell to the command to recurse the drivers' subfolders for valid .inf drivers and by including the /ForceUnsigned you tell the command to ignore driver signing requirements.

To test USB ports with the PassMark USB 2.0 Loopback plug the PMUSB drivers need to be installed in the WinPE build. Copy the driver files (*.inf, *.sys, *.cat etc) to a temporary directory. For example,

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for a 32-bit WinPE build, copy the 32-bit Passmark USB 2.0 Loopback driver files to `c:\bitpe\drivers\usb` and install the INF package.

```
DISM /image:c:\bitpe\mount\ /Add-Driver /driver:c:\bitpe\drivers\usb /recurse /ForceUnsigned
```

Note: After installing the drivers, you can use the "DISM /Get-Drivers" command to see which drivers are installed.

For example,

```
DISM /image:c:\bitpe\mount\ /Get-Drivers -- View 3rd party drivers
```

```
DISM /image:c:\bitpe\mount\ /Get-Drivers /all -- View all drivers
```

5. Install the BurnInTest software and msvfw32.dll.

After step 2, you can find the directory structure of the PE with Windows Explorer.

First, put the [msvfw32.dll](#) (Microsoft Video for Windows, required regardless of whether you use the Video playback test) into `mount\windows\system32`. This must be the version suitable for your target Operating System. If you use the wrong dll (e.g. 64-bit on 32-bit Windows), BurnInTest will simply not start – and no error message will be displayed.

Second, in BurnInTest, choose the option to Install to USB (File->Install BurnInTest to a USB drive...). Specify the Installation location Directory as `mount\program files\BurnInTest`, specify the installation type as Licensed and paste your license key into the Username and key section.

If you have a BurnInTest configuration you want to use, place this configuration in the new BurnInTest folder as well. The steps following assume that a configuration, `test.bitcfg`, has been prepared to test the CPU, Optical Drive, RAM, Network and HDD, and has been copied to the `mount\program files\BurnInTest` directory.

The following example uses a program called `setres` to set the resolution to 1024x768. The default resolution for Win PE is 800x600. These files have been installed, but they are optional.

Note: If you want your own image for the WinPE background, replace the default image `mount\Windows\System32\winpe.bmp` with your own image.

6. Automate the launching of BIT.

There are two methods that you can use to launch BIT. You can either edit `\mount\windows\system32\startnet.cmd` or create a `winpeshl.ini` file and place it in the `\mount\windows\system32` directory. For testing purposes, it is recommended you use the `startnet.cmd` method, because you will have access to the command prompt. If you use `winpeshl.ini`, you will not be able to use a command prompt, but will stop regular users from having direct access into the PE itself once booted. You should not use both options, if `winpeshl.ini` is present, it will ignore the `startnet.cmd` file. If you are going to test the hard disk, it will need to be formatted first. This guide uses the idea that the hard drive is blank, and we will use the PE to format the disk first. You would not want to use this option if you are going to test computers with Windows or other OS installed on them already.

See the full command lines under `startnet.cmd` to see what the batch files are doing.

winpeshl.ini

[LaunchApps]

```
%SYSTEMDRIVE%\Windows\System32\wpeinit.exe  
%SYSTEMDRIVE%\Windows\System32\diskpart.exe, " /s  
%SYSTEMDRIVE%\Windows\System32\diskpart.txt"  
"%SYSTEMDRIVE%\Program Files\BurnInTest\bit.exe", "-h -x -r -c test.bitcfg"
```

Note the use of quotations – it is important.

Note:

-C [configfilename]

Loads the configuration file specified by [configfilename]

test.bitcfg specifies an optional configuration file copied in step 5.

-h

Set the screen resolution to 1024 x 768 with 32-bit color on startup.

-r

Executes the tests immediately without needing to press the go button. It also skips the pre-test warning message.

-x

Skip the DirectX version checks at startup time. This can be useful for users that do not want to install the latest version of DirectX and do not want to use the DirectX tests (eg. 3D tests).

Warning!

Diskpart.exe is only required if your disk is unformatted – this will delete any data on physical drive 0. If your hard disk is formatted, do not include the disk partitioning tool line shown above.

I.e. The following line should only be used to format a hard disk – it is optional:

```
%SYSTEMDRIVE%\Windows\System32\diskpart.exe,  
"%SYSTEMDRIVE%\Windows\System32\diskpart.txt"
```

Please note that at the time of writing the BurnInTest Raw disk test is not supported under WinPE.

Note: BurnInTest 7.0 automatically configures the serial ports to allow them to be detected and tested, so no additional configuration is required to test serial ports.

If you want to test parallel ports you need to ensure the parallel port service is started and install the drivers. For example:

winpeshl.ini

[LaunchApps]

```
%SYSTEMDRIVE%\Windows\System32\wpeinit.exe  
"%SYSTEMDRIVE%\Windows\System32\net", "start parport"  
"%SYSTEMDRIVE%\Windows\devcon.exe", "install x:\windows\inf\msports.inf ACPI\PNP0401"  
"%SYSTEMDRIVE%\Windows\devcon.exe", "restart *PNP0401"  
"%SYSTEMDRIVE%\Program Files\BurnInTest\bit.exe", "-h -x"
```

*devcon will need to be downloaded from Microsoft and included in the WinPE build in the Windows directory.

Startnet.cmd

wpeinit

diskpart /s diskpart.txt

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```
"x:\Program Files\burnintest\bit.exe" -h -x -r -c test.bitcfg
```

Notes:

- BurnInTest 7.0 automatically configures the serial ports to allow them to be detected and tested, so no additional configuration is required to test serial ports.
- if you want to test parallel ports you need to ensure the parallel port service is started and install the drivers. Add these commands to Startnet.cmd before bit.exe is started, for example, startnet.cmd:
wpeinit
net start parport
devcon install x:\windows\inf\msports.inf ACPI\PNP0401
devcon restart *PNP0401
"x:\Program Files\burnintest\bit.exe" -h -x

*devcon will need to be downloaded from Microsoft and included in the WinPE build in the Windows directory.

diskpart.txt

```
select disk 0  
clean  
create partition primary  
select partition 1  
active  
format quick fs=ntfs  
assign letter=c
```

Warning!

This is only if your disk is unformatted – this will delete any data on physical drive 0.

7. Commit the changes and save the image

Create a winpe.wim image from the local directory.

```
DISM /unmount-wim /MountDir:c:\bitpe\mount /Commit
```

8. Make the boot disk

Now at this point you can *rename the c:\bitpe\winpe.wim to boot.wim and place it in the ISO\sources folder* to burn a CD, USB Flash Drive or you can add it to the Boot Images in Windows Deployment Services.

9a. To make a bootable CD/DVD

To make an iso image for burning to CD:

```
OSCDIMG -n -h -bc:\bitpe\etfsboot.com c:\bitpe\iso c:\bitpe.iso
```

Now burn the iso image (c:\bitpe.iso) to the CD/DVD. You can use the CD/DVD burning software that comes with Windows 7 or use third-party software.

9b. To make a bootable USB Flash Drive (UFD)

SOFTWARE

From the command prompt, partition and format the UFD. Make sure you select the correct disk number, as this will delete everything on the disk (the below example shows a UFD with physical disk number 2 and volume letter X).

```
C:\Users\Administrator>diskpart
```

```
DISKPART> list disk
```

```
DISKPART> select disk 2
```

```
DISKPART> clean
```

```
DISKPART> create partition primary
```

```
DISKPART> select partition 1
```

```
DISKPART> active
```

```
DISKPART> format fs=fat32 (or ntfs)
```

```
DISKPART> assign
```

```
DISKPART> exit
```

```
C:\Users\Administrator>xcopy c:\bitpe\iso\*.* X:\ /s /e /f
```

Example WinPE build

A 64-bit build example:

<Open the "Deployment tools Command Prompt" with administrator privileges>

```
copy c:\bitpe_x64
```

```
DISM /Mount-wim /WimFile:c:\bitpe_x64\winpe.wim /index:1 /MountDir:c:\bitpe_x64\mount
```

```
DISM /image:c:\bitpe_x64\mount /Add-Package /PackagePath:"C:\Program Files\Windows AIK\Tools\PETools\amd64\WinPE_FPs\winpe-wmi.cab"
```

```
DISM /image:c:\bitpe_x64\mount /Add-Package /PackagePath:"C:\Program Files\Windows AIK\Tools\PETools\amd64\WinPE_FPs\winpe-hta.cab"
```

```
DISM /image:c:\bitpe_x64\mount /Add-Package /PackagePath:"C:\Program Files\Windows AIK\Tools\PETools\amd64\WinPE_FPs\winpe-scripting.cab"
```

<Install required device drivers for your target Operating System – refer Step 4> For example, to install the PassMark USB 2.0 Loopback drivers that are in c:\bitpe_x64\drivers\usb:

```
DISM /image:c:\bitpe_x64\mount /Add-Driver /driver:c:\bitpe_x64\drivers\usb /recurse /ForceUnsigned
```

<Install 64-bit BurnInTest and 64-bit msvfw32.dll for your target Operating System – refer step 5>

<Create startnet.cmd or winpeshl.ini – refer step 6>

```
DISM /unmount-Wim /MountDir:c:\bitpe_x64\mount /Commit
```

<Copy winpe.wim to iso\sources\boot.wim – refer step 8>

```
OSCDIMG -n -h -bc:\bitpe_x64\etfsboot.com c:\bitpe_x64\iso c:\bitpe_x64.iso
```

<Burn c:\bitpe_x64.iso to an optical disk or copy it to a Bootable USB Flash Drive, refer step 9>

Please consult the documentation that comes with the WAIK/OPK Tools for further information or configurations.

Adding drivers to the WinPE image

This section describes how to install device drivers into an existing WinPE image for updated hardware.

1. Make a copy of the WinPE image to work with.

For example, if your WinPE image is on a UFD, copy the contents of the UFD to c:\pctk

2. Create a directory to mount the image into.

e.g. c:\pctk\mount (this must be an empty directory).

3. Copy your driver files

Copy your driver files (*.inf, *.sys, *.cat etc) to a temporary directory, e.g. copy the 32-bit Passmark USB 2.0 Loopback drivers to c:\pctk\drivers.

4. Check if your image file (.wim) has more than 1 image in it.

```
DISM /Get-Wiminfo /wimfile:c:\bitpe\sources\boot.wim
```

```
...  
Index : 1  
...
```

5. Mount the WinPE image from the .wim file

Extract the base image to a local directory.

```
DISM /Mount-wim /WimFile:c:\bitpe\sources\boot.wim /index:1 /MountDir:c:\bitpe\mount
```

6. Install an INF package (typically a driver) to a Windows PE image.

```
DISM /image:c:\bitpe\mount\ /Add-Driver /driver:c:\bitpe\drivers /recurse /ForceUnsigned
```

```
Deployment Image Servicing and Management tool  
Version: 6.1.7600.16385
```

```
Image Version: 6.1.7600.16385
```

```
Searching for driver packages to install...  
Found 1 driver package(s) to install.  
Installing 1 of 1 - c:\pctk\drivers\PMUSB2.inf: The driver package was successfully installed.  
The operation completed successfully.
```

7. Save the changes

Create a WinPE image from the local directory.

```
DISM /unmount-wim /MountDir:c:\bitpe\mount /Commit
```

8. Create a bootable CD/DVD or UFD.

Follow steps 8 and 9 in the "Building a Preinstall Environment" to create a bootable CD/DVD or UFD.

Notes:

Please note that we can't guarantee that all hardware will work after including the drivers, as the changes required may be more than just adding drivers. For example, just adding graphics card devices drivers won't allow the 3D test to run as it also needs DirectX (as such we don't support all tests under WinPE).

We have successfully tested this driver installation process with our USB 2.0 Loopback plugs.