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1 Introduction

1.1 Description

The 3-Heights™ PDF to Image Converter Shell converts PDF documents into single page or multi-page raster images such as TIFF or JPEG. It can also convert PDF files into rasterized PDF. Its areas of use include the web, TIFF-based DMS solutions, archive and workflow systems and the protection of PDF documents. The Converter is characterized by its high speed and outstanding quality.

1.2 Functions

The 3-Heights™ PDF to Image Converter Shell merges pages from different input files to form one or more files. Color space and image size are defined automatically during the process. The Converter supports scaled and un-scaled conversions and a variety of image formats such as PNG, TIFF, JBIG2 or JPEG2000.

1.2.1 Features

**PDF to Image**

- Create single page and multi-page image files and rasterized PDF documents
- Convert individual pages
- Convert PDF files to CCITT fax files
- Define page dimensions in points or pixels
- Set rotation (Force portrait or landscape or inherit rotation from original document)
- Set resolution (DPI)
- Dithering (Floyd Steinberg, Halftone Block, Halftone Continuous, Atkinson)
- Set image filters
- Set color depth
- Set color space
- Set TIFF file compression
- Set the quality of lossy image compression
- Set bit filling order for fax files
- Add Watermark images

**PDF to PDF Image**

- Raster PDF content (image)
- Keep or remove links, outlines or viewer preferences in PDF output document

1.2.2 Formats

**Input Formats**

- PDF 1.x (PDF 1.0, . . ., PDF 1.7)
- PDF 2.0
- PDF/A-1, PDF/A-2, PDF/A-3
Output Formats

- TIFF (Tagged Image File Format)
- JPEG (Joint Photographic Expert Group)
- PNG (Portable Network Graphics)
- GIF (Graphics Interchange Format)
- BMP (Window Bitmap)
- EPS (Encapsulated PostScript)
- JBIG2 (Joint Bi-level Image Experts Group)
- JPEG2000
- Extended JPEG2000
- PBM (Portable Bitmap File Format)

Conformance

Standards:

- ISO 32000-1 (PDF 1.7)
- ISO 32000-2 (PDF 2.0)
- ISO 19005-1 (PDF/A-1)
- ISO 19005-2 (PDF/A-2)
- ISO 19005-3 (PDF/A-3)

1.3 Operating Systems

The 3-Heights™ PDF to Image Converter Shell is available for the following operating systems:

- Windows Client 7+ | x86 and x64
- Linux:
  - Red Hat, CentOS, Oracle Linux 7+ | x64
  - Fedora 29+ | x64
  - Debian 8+ | x64
  - Other: Linux kernel 2.6+, GCC toolset 4.8+ | x64
- macOS 10.10+ | x64

‘+’ indicates the minimum supported version.
2 Installation

2.1 Windows

The 3-Heights™ PDF to Image Converter Shell comes as a ZIP archive or as an MSI installer.

The installation of the software requires the following steps.

1. You need administrator rights to install this software.
2. Log in to your download account at [http://www.pdf-tools.com](http://www.pdf-tools.com). Select the product “PDF to Image Converter Shell”. If you have no active downloads available or cannot log in, please contact [pdfsales@pdf-tools.com](mailto:pdfsales@pdf-tools.com) for assistance.

   You will find different versions of the product available. We suggest to download the version, which is selected by default. A different version can be selected using the combo box.

   There is an MSI (*.msi) package and a ZIP (*.zip) archive available. The MSI (Microsoft Installer) package provides an installation routine that installs and uninstalls the product for you. The ZIP archive allows you to select and install everything manually.

   There is a 32 and a 64-bit version of the product available. While the 32-bit version runs on both, 32 and 64-bit platforms, the 64-bit version runs on 64-bit platforms only. The MSI installs the 64-bit version, whereas the ZIP archive contains both the 32-bit and the 64-bit version of the product. Therefore, on 32-bit systems, the ZIP archive must be used.

3. If you select an MSI package, start it and follow the steps in the installation routine.
4. If you are using the ZIP archive, do the following. Unzip the archive to a local folder, e.g. `C:\Program Files\PDF Tools AG\`

   This creates the following subdirectories:

<table>
<thead>
<tr>
<th>Subdirectory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bin</td>
<td>Contains the runtime executable binaries.</td>
</tr>
<tr>
<td>doc</td>
<td>Contains documentation.</td>
</tr>
</tbody>
</table>

5. (Optional) To easily use the 3-Heights™ PDF to Image Converter Shell from a shell, the directory needs to be included in the “Path” environment variable.

6. (Optional) Register your license key using the License Management.

7. Ensure the cache directory exists as described in chapter Special Directories.

8. Make sure your platform meets the requirements regarding color spaces and fonts described in chapters Color Profiles and Fonts respectively.

2.1.1 How to set the Environment Variable “Path”

To set the environment variable “Path” on Windows, go to Start → Control Panel (classic view) → System → Advanced → Environment Variables.

Select “Path” and “Edit”, then add the directory where `pdf2imgR2.exe` is located to the “Path” variable. If the environment variable “Path” does not exist, create it.
2.2 Linux and macOS

This section describes installation steps required on Linux or macOS.

Here is an overview of the files that come with the 3-Heights™ PDF to Image Converter Shell:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bin/x64/pdf2imgR2</td>
<td>This is the main executable.</td>
</tr>
<tr>
<td>doc/<em>.</em></td>
<td>Documentation</td>
</tr>
</tbody>
</table>

2.2.1 Linux

1. Unpack the archive in an installation directory, e.g. /opt/pdf-tools.com/
2. Verify that the GNU shared libraries required by the product are available on your system:

```
$ ldd pdf2imgR2
```

In case the above reports any missing libraries you have three options:

a. Download an archive that is linked to a different version of the GNU shared libraries and verify whether they are available on your system. Use any version whose requirements are met. Note that this option is not available for all platforms.

b. Use your system's package manager to install the missing libraries. It usually suffices to install the package `libstdc++6`.

c. Use GNU shared libraries provided by PDF Tools AG:
   2. Download the GNU shared libraries for your platform.
3. Install the libraries manually according to your system's documentation. This typically involves copying them to your library directory, e.g. `/usr/lib` or `/usr/lib64`, and running `ldconfig`.

4. Verify that the GNU shared libraries required by the product are available on your system now.

3. Create a link to the executable from one of the standard executable directories, e.g:

   ```bash
   ln -s /opt/pdf-tools.com/bin/x64/pdf2imgR2 /usr/bin
   ```

4. Optionally register your license key using the [Command Line License Manager Tool](#).
5. Ensure the cache directory exists as described in chapter [Special Directories](#).
6. Make sure your platform meets the requirements regarding color spaces and fonts described in chapters [Color Profiles](#) and [Fonts](#) respectively.

## 2.3 Uninstall

If you have used the MSI for the installation, go to Start → 3-Heights™ PDF to Image Converter Shell... → Uninstall...

If you have used the ZIP file for the installation: In order to uninstall the product, undo all the steps done during installation.

## 2.4 Note about the Evaluation License

With the evaluation license the 3-Heights™ PDF to Image Converter Shell automatically adds a watermark to the output files.

## 2.5 Special Directories

### 2.5.1 Directory for temporary files

This directory for temporary files is used for data specific to one instance of a program. The data is not shared between different invocations and deleted after termination of the program.

The directory is determined as follows. The product checks for the existence of environment variables in the following order and uses the first path found:

**Windows**

1. The path specified by the `%TMP%` environment variable.
2. The path specified by the `%TEMP%` environment variable.
3. The path specified by the `%USERPROFILE%` environment variable.
4. The Windows directory.

**Linux and macOS**

1. The path specified by the `$PDFTMPDIR` environment variable.
2. The path specified by the `$TMP` environment variable.
3. The `/tmp` directory.
2.5.2 Cache Directory

The cache directory is used for data that is persisted and shared between different invocations of a program. The actual caches are created in subdirectories. The content of this directory can safely be deleted to clean all caches. This directory should be writable by the application, otherwise caches cannot be created or updated and performance will degrade significantly.

**Windows**

- If the user has a profile:
  
  `%LOCAL_APPDATA%\PDF Tools AG\Caches`

- If the user has no profile:
  
  `<TempDirectory>\PDF Tools AG\Caches`

**Linux and macOS**

- If the user has a home directory:
  
  `~/.pdf-tools/Caches`

- If the user has no home directory:
  
  `<TempDirectory>/pdf-tools/Caches`

where `<TempDirectory>` refers to the Directory for temporary files.

2.5.3 Font Directories

The location of the font directories depends on the operating system. Font directories are traversed recursively in the order as specified below.

If two fonts with the same name are found, the latter one takes precedence, i.e. user fonts will always take precedence over system fonts.

**Windows**

1. `%SystemRoot%\Fonts`
2. User fonts listed in the registry key `\HKEY_CURRENT_USER\Software\Microsoft\Windows NT\CurrentVersion\Fonts`. This includes user specific fonts from `C:\Users\<user>\AppData\Local\Microsoft\Windows\Fonts` and app specific fonts from `C:\Program Files\WindowsApps` directory `Fonts`, which must be a direct sub-directory of where `pdf2imgR2.exe` resides.

**macOS**

1. `/System/Library/Fonts`
2. `/Library/Fonts`

**Linux**

1. `/usr/share/fonts`
2. `/usr/local/share/fonts`
3. `~/.fonts`
4. `$PDFFONTDIR` or `/usr/lib/X11/fonts/Type1`
3 License Management

The 3-Heights™ PDF to Image Converter Shell requires a valid license in order to run correctly. If no license key is set or the license is not valid, then the executable will fail and the return code will be set to 10.

3.1 License Installation and Management

There are three possibilities to pass the license key to the application:

1. The license key is installed using the GUI tool (graphical user interface). This is the easiest way if the licenses are managed manually. It is only available on Windows.
2. The license key is installed using the shell tool. This is the preferred solution for all non-Windows systems and for automated license management.
3. The license key is passed to the application at run-time via the switch -lk. This is the preferred solution for OEM scenarios.

3.1.1 Graphical License Manager Tool

The GUI tool LicenseManager.exe is located in the bin directory of the product kit (Windows only).

List all installed license keys

The license manager always shows a list of all installed license keys in the left pane of the window. This includes licenses of other PDF Tools products. The user can choose between:

- Licenses available for all users. Administrator rights are needed for modifications.
- Licenses available for the current user only.

Add and delete license keys

License keys can be added or deleted with the “Add Key” and “Delete” buttons in the toolbar.

- The “Add key” button installs the license key into the currently selected list.
- The “Delete” button deletes the currently selected license keys.

Display the properties of a license

If a license is selected in the license list, its properties are displayed in the right pane of the window.
3.1.2 Command Line License Manager Tool

The command line license manager tool licmgr is available in the bin\x86 and bin\x64 directory.

Note: The command line tool licmgr is not included in Windows platform kits, as the GUI tool is the recommended tool for managing licenses. A Windows licmgr shell tool is available in the Utilities & Tools section of your My PDF Tools customer account.

A complete description of all commands and options can be obtained by running the program without parameters:

```
licmgr
```

List all installed license keys

```
licmgr list
```

The currently active license for a specific product is marked with a * on the left side.

Example:

```
>licmgr list
Local machine:
  Product Name:
    1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
    1-YYYYY-YYYYY-YYYYY-YYYYY-YYYYY-YYYYY-YYYYY
    * 1-ZZZZZ-ZZZZZ-ZZZZZ-ZZZZZ

Current user:
```

Add and delete license keys

Install new license key:

```
licmgr store 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

Delete old license key:

```
licmgr delete 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

Both commands have the optional argument -s that defines the scope of the action:

- g For all users
- u Current user

Display the properties of a license

```
licmgr info 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```
Properties that invalidate the license are marked with an X, properties that require attention are marked with an !. In that case an additional line with a comment is displayed.

**Example:**

```
> licmgr info 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
- Key:          1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
- Product:      Product Name
- Features:     Feature1,Feature2
- Intended use: Development
- Watermark:    No
- Platform:     Windows
- Installation: Yes
! Activation:   2018-05-07
   (The license has not yet been activated.)
- Expiration:   Does not expire
- Maintenance: 2019-04-27
```

### 3.2 License Selection and Precedence

#### 3.2.1 Selection

If multiple keys for the same product are installed in the same scope, only one of them can be active at the same time.

Installed keys that are not selected are not considered by the software!

**In the Graphical User Interface** use the check box on the left side of the license key to mark a license as selected.

**With the Command Line Interface** use the select subcommand:

```
licmgr select 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

#### 3.2.2 Precedence

License keys are considered in the following order:

1. License key passed at runtime.
2. License selected for the current user
3. License selected for the current user (legacy key format)
4. License selected for all users
5. License selected for all users (legacy key format)

The first matching license is used, regardless whether it is valid or not.
3.3 Key Update

If a license property like the maintenance expiration date changes, the key can be update directly in the license manager.

In the Graphical User Interface select the license and press the button “Update Key” in the toolbar:

![Image of license manager interface]

With the Command Line Interface use the update subcommand:

```
licmgr update 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.4 License activation

New licenses keys have to be activated (except for OEM licenses).

**Note:** Licenses that need activation have to be installed in the license manager and must not be passed to the component at runtime.

The license activation is tied to a specific computer. If the license is installed at user scope, the activation is also tied to that specific user. The same license key can be activated multiple times, if the license quantity is larger than 1. Every license key includes a date, after which the license has to be activated, which is typically 10 days after the issuing date of the key. Prior to this date, the key can be used without activation and without any restrictions.

3.4.1 Activation

The License can be activated directly within the license manager. Every activation increases the activation count of the license by 1.

It is recommended to add a comment to the activation request which helps keeping track of all activations for a specific license key. In case of problems it also helps us providing support. The comment is stored in the activation database as long as the license key remains activated. Upon deactivation it is deleted from the database immediately.

All activations and the corresponding comments can be examined using the Load online properties function of the license manager. The information is accessible to anyone with access to the license key.

In the Graphical User Interface select the license and press the button “Activate license” in the toolbar:

![Image of license manager interface]

It is recommended to add a comment to the activation request by using the subsequent dialog box.
With the Command Line Interface use the activate subcommand:

```
licmgr activate 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

Note that the key has to be installed first.

It is recommended to add a comment to the activation request by using the `–c` or `–cd` option:

```
licmgr activate -cd 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
licmgr activate -c "custom comment" 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

### 3.4.2 Reactivation

The activation is tied to specific properties of the computer like the MAC address or host name. If one of these properties changes, the activation becomes invalid and the license has to be reactivated. A reactivation does not increase the activation count on the license.

The process for reactivation is the same as for the activation.

**In the Graphical User Interface** the button “Activate license” changes to “Reactivate license”:

![Reactivate license](image)

With the Command Line Interface the subcommand activate is used again:

```
licmgr activate 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

### 3.4.3 Deactivation

To move a license to a different computer, it has to be deactivated first. Deactivation decreases the activation count of the license by 1.

The process for deactivation is similar to the activation process.

**In the Graphical User Interface** select the license and press the button “Deactivate license” in the toolbar:

![Deactivate license](image)

With the Command Line Interface use the deactivate subcommand:

```
licmgr deactivate 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

### 3.5 Proxy Setting

A proxy URL can be configured for computers that cannot access the internet without a web proxy.
Note: The proxy must allow connections via HTTP CONNECT to the server www.pdf-tools.com:443.

In the Graphical User Interface press the button “Settings” in the toolbar:

and enter the proxy URL in the respective field:

3.6 Offline Usage

The following actions in the license manager need access to the internet:

- License Activation
- License Reactivation
- License Deactivation
- Key Update

On systems without internet access, a three step process can be used instead, using a form on the PDF Tools website.

3.6.1 First Step: Create a Request File

In the Graphical User Interface select the license and use the dropdown menu on the right side of the button in the toolbar:

With the Command Line Interface use the `-fs` option to specify the destination path of the request file:

```
licmgr activate -fs activation_request.bin 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

License Deactivation: When saving the deactivation request file, the license is deactivated immediately and cannot be used any further. It can however only be activated again after completing the deactivation on the website.
3.6.2 Second Step: Use Form on Website


Upon success, the response will be downloaded automatically if necessary.

3.6.3 Third Step: Apply the Response File

In the Graphical User Interface select the license and use the dropdown menu on right side of the button in the toolbar:

![License Management Interface](image)

With the Command Line Interface use the `-fl` option to specify the source path of the response file:

```bash
licmgr activate -fl activation_response.bin 1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX
```

3.7 License Key Versions

As of 2018 all new keys will have the format `1-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX`. Legacy keys with the old format `0-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX` are still accepted for a limited time period.

For compatibility reasons, old and new version keys can be installed side by side and one key of each version can be selected at the same time. In that case, the software always uses the new version.

3.8 License Key Storage

Depending on the platform the license management system uses different stores for the license keys.

3.8.1 Windows

The license keys are stored in the registry:

- `HKLM\Software\PDF Tools AG` (for all users)
3.8.2 macOS

The license keys are stored in the file system:
- /Library/Application Support/PDF Tools AG (for all users)
- ~/Library/Application Support/PDF Tools AG (for the current user)

3.8.3 Unix/Linux

The license keys are stored in the file system:
- /etc/opt/pdf-tools (for all users)
- ~/.pdf-tools (for the current user)

Note: The user, group and permissions of those directories are set solely by the license manager tool. It may be necessary to change permissions to make the licenses readable for all users. Example:

```
chmod -R go+rx /etc/opt/pdf-tools
```

3.9 Troubleshooting

3.9.1 License key cannot be installed

The license key cannot be installed in the license manager application. The error message is: "Invalid license format."

Possible causes:
- The license manager application is an older version that only supports the legacy key format.

Solution

Use a current version of the license manager application or use a license key in the legacy key format if available.

3.9.2 License is not visible in license manager

The license key was successfully installed previously but is not visible in the license manager anymore. The software is still working correctly.

Possible causes:
- The license manager application is an older version that only supports the legacy key format.

Solution

Use a current version of the license manager application.
3.9.3 License is not found at runtime

The license is not found at runtime by the software. The error message is: "No license key was set."

Possible causes:

- The license key is actually missing (not installed).
- The license key is installed but not selected in the license manager.
- The application is an older version that only supports the legacy key format, while the license key has the new license format.

Solution

Install and select a valid license key that is compatible with the installed version of the software or use a newer version of the software. The new license key format is supported starting with version 4.10.26.1

For compatibility reasons, one license key of each format can be selected at the same time.

3.9.4 Eval watermark is displayed where it should not

The software prints an evaluation watermark onto the output document, even if the installed license is a productive one.

Possible causes:

- There is an evaluation license key selected for the current user, that takes precedence over the key for all users.

Note: The software might be run under a different user than the license manager application.

- An evaluation license key that is passed at runtime takes precedence over those selected in the license manager.
- There is an evaluation license key selected with a newer license format that takes precedence over the key in the older format.
- The software was not restarted after changing the license key from an evaluation key to a productive one.

Solution

Disable or remove all evaluation license in all scopes, check that no evaluation key is passed at runtime and restart the software.

3.9.5 Activation is not recognized

The license is installed and activated in the license manager, but the software does not recognize it as activated.

The error message is: "The license has not been activated."

Possible causes:

- There is an unregistered license key selected for the current user, that takes precedence over the key for all users. This leads to an error even if the same license is registered for all users.
Note: The software might be run under a different user than the license manager application.

- A license key that is passed at runtime takes precedence over those selected in the license manager. This leads to an error even if the same license is registered in the license manager.

Note: Licenses that need activation have to be installed in the license manager and must not be passed to the component at runtime.

- The software was not restarted after activating the license.

**Solution**
Disable, remove or activate all unregistered licenses in all scopes, check that no key is passed at runtime and restart the software.

### 3.9.6 Activation is invalidated too often

The license activation is invalidated regularly, for no obvious reason.

**Possible causes:**
- One of the properties used to calculate the system fingerprint is changing frequently.

**Solution**
Update to a newer version of the PDF Tools product, deactivate the license key using the new license manager and activate it again. After that, an improved fingerprinting algorithm is used. Deactivation and activation have to be **executed separately**, a reactivation of the license in one step does not change the fingerprinting algorithm and thus does not solve the problem.

Note: After this procedure, older products might not recognize the activation as valid anymore. Reactivating the license using an old license manager will revert the activation to the old fingerprinting algorithm.

### 3.9.7 Connection to the licensing service fails

The license activation/deactivation/update fails because the license manager cannot reach the licensing server. The error message depends on the platform and the exact error condition.

**Possible causes:**
- The computer is not connected to the internet.
- The connection is blocked by a corporate firewall.

**Solution**
Make sure that the computer is connected to the internet and that the host `www.pdf-tools.com` is reachable on port 443 (HTTPS).
If this is not possible, try Offline Usage instead.

3.9.8 Offline usage fails due to a request/response mismatch

The offline license activation/deactivation/update fails because the response file does not match the request file. The error message is: "Mismatch between request and response."

Possible causes:

- The response file is applied to a different machine than the request file was created.
- The response file as applied to a different user than the request file was created.
- The response file was applied to a specific user while the request was created for all users, or vice versa.
- The response file is applied to the wrong license key.
- Another request file has been created between creating the request file and applying the response file.
- The license key was updated between creating the request file and applying the response file.
- The license key was removed and re-added between creating the request file and applying the response file.

Solution

Delete any old request and response files to make sure they are not used by accident.

Retry the entire process as outlined in chapter 3.6 and refrain from making any other license-related actions between creating the request file and applying the response file.

Make sure that the response file is applied to exactly the same license key in exactly the same location (machine, all users or specific user) where the request file was created.
4 User’s Guide

The 3-Heights™ PDF to Image Converter Shell provides the executable pdf2imgR2

pdf2imgR2 is used to convert PDF files to raster images, such as TIFF, JPEG, etc. The functionality of this executable is documented in this manual.

All switches are described in the usage of the tool. (Type pdfimgR2 with no arguments to list the usage).

4.1 Getting Started

The simplest command requires one parameter: The name of the PDF input file. When no output file name is specified, the output file will be named as the input file, and the image type TIFF is selected.

Example: The following command

```
pdf2imgR2 input.pdf
```

creates an uncompressed TIFF file. It inherits the name of the input file and is named:

```
input.tif
```

If the PDF file has more than one page, the generated TIFF will be a multi-page TIFF. Keep in mind that TIFF supports multi-paging whereas most other image formats are single-page formats.

4.2 Specify Image Type, File Name and Output Folder

The name and type of the output file can be specified using a second parameter. Here is a list of supported extensions and the corresponding file type:

<table>
<thead>
<tr>
<th>Extension</th>
<th>File Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>.tif, .tiff</td>
<td>Tagged Image File Format</td>
</tr>
<tr>
<td>.jpg, .jpe, .jpeg</td>
<td>Joint Photographic Expert Group (JPEG)</td>
</tr>
<tr>
<td>.png</td>
<td>Portable Network Graphics</td>
</tr>
<tr>
<td>.gif</td>
<td>Graphics Interchange Format</td>
</tr>
<tr>
<td>.bmp</td>
<td>Window Bitmap</td>
</tr>
<tr>
<td>.jb2</td>
<td>Joint Bi-level Image Experts Group</td>
</tr>
<tr>
<td>.jp2</td>
<td>JPEG2000</td>
</tr>
<tr>
<td>.jpx</td>
<td>Extended JPEG2000</td>
</tr>
</tbody>
</table>
### File Formats

<table>
<thead>
<tr>
<th>File Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.pbm, .pgm, .pnm, .ppm</td>
<td>Portable Bitmap File Format</td>
</tr>
<tr>
<td>.eps</td>
<td>Encapsulated PostScript (Output only)</td>
</tr>
</tbody>
</table>

**Example:** The following command creates a JPEG image in the current working folder

```
pdf2imgR2 input.pdf output.jpg
```

**Example:** The output directory can simply be added in front of the output file name

```
pdf2imgR2 input.pdf myfolder\output.jpg
```

or absolute

```
pdf2imgR2 input.pdf C:\myfolder\output.jpg
```

**Example:** Quotes must be used for paths or file names that contain blanks

```
pdf2imgR2 "My File.pdf" "My Documents\output.jpg"
```

### 4.3 Single Page or Multi Page Images

By default, the PDF to Image Converter generates multi-page images if the TIFF format is selected and the input PDF has more than one pages. To create one TIFF file per PDF page, simply use the switch `-1`. This option should also be used for all other formats, which do not support multi-paging, if the input PDF document has more than one page. When doing so, the output files can be named with wildcards.

**Example:** Create images consisting of 1 page per image, add the page number to the file name as four digit number:

```
pdf2imgR2 -1 input.pdf output%04d.png
```

Image files created this way are named `output0001.png`, `output0002.png`, `output0003.png`, etc.

### 4.4 How to Reduce the File Size

There are different ways to reduce the file size of an image. One needs to be aware that from a certain point on, a smaller file size results in a poorer visual quality.

The main factors on which the file size of an image depends are:

- Dimensions in pixel (width and height)
- Bits per pixel
Compression Type
The content of the image (influenced by dithering)

4.4.1 Dimensions
Reducing the dimensions and therefore the amount of the total pixels reduces also the file size. Obviously a 1024x768 pixel image has a larger file size than an equivalent 600x480 image.

Example: Set the dimensions in pixels.
```
-sp 600 480 -f
```

Example: Set the dimension in points.
```
-s 600 480 -f
```

If the dimensions are set in points, the dimensions in pixel are computed depending on the resolution.

4.4.2 Resolution
The resolution in dots per inch (DPI) lets you specify how detailed the image is. The default value is 150 DPI, which generates an image that looks sharp when not zoomed into. A larger value generates a more detailed image, but also will increases the file size, because it requires more pixels. On the other hand, a lower resolution generates a file with a smaller file size, but the image is also of lower visual quality.

Example: Setting the resolution value to 75 DPI instead of 150 DPI reduces the file size to about one quarter.
```
-d 75
```

4.4.3 Bits per Pixel
Using 1-bit (black/white) or 8-bit grey scale instead of 24-bit true color will reduce the file size. Keep in mind that not all formats support all color depths.

8-bit grey scale images are a third as large in size as 24-bit color images. With 1-bit images that use dithering, the size heavily depends on the content. It can be as small as 1% of the 8-bit image.

Example: Create a gray scale image.
```
-b 8
```

Example: Create a bi-level image with Atkinson dithering.
```
-b 1 -h 6 -oq
```
4.4.4 Format/Compression Type

The 3-Heights™ PDF to Image Converter Shell supports various image formats. For most formats the compression is given. For example a PNG image is always Flate-compressed, a JPEG image is always JPEG-compressed. However for TIFF, the compression type is selectable.

Images formats that are supported by most Internet browsers are JPEG, GIF and PNG.

There are two fundamentally different types of compression: Lossless and lossy.

Lossless compression  The transformation from the original to the compressed state of the image does not change the content. Thus the transformation is reversible and the original image can be regained from the compression state.

Lossless compression is normally used for artificial images or scanned text. It is applied to the following types of images: GIF, PNG, BMP, JPEG2000 if quality is set to 100, JBIG2 and TIFF compressed with G3, G4, LZW or Flate.

Lossy compression  The compression algorithm alters the content of the image in a way that it compresses better. Thus a lossy compressed image cannot be reverted back to its original state. It also means multiple applications of lossy compression to the same image alter the image every time and thereby reduce the quality every time. How much the image may be altered to improve the compression rate is controlled by a quality index ranging from 1 to 100 and normally defaulted at 75.

Lossy algorithms usually provide a better compression rate, at the cost of visual quality. Lossy compression is normally used for photographs.

It is applied to the following types of images: JPEG, and JPEG2000 if quality is less than 100.

There are various compression types supported for the TIFF image format. These are:
- CCITT Group 3, Group 3-2D  CCITT Group 3 is the predecessor to CCITT Group 4, it is a simpler algorithm that normally results in a lower compression ratio.
- CCITT Group 4  CCITT Group 4 is the standard compression for bi-level TIFF images (i.e. facsimile).
- LZW  LZW (Lempel-Ziv-Welch) compression is a lossless compression algorithm for images. Please consult the copyright laws of your country prior to using this compression algorithm.
- JPEG  TIFF allows images to be compressed with JPEG, which is a lossy compression algorithm. JPEG provides a high compression ratio for 8 and 24 bit images. It is best suited for TIFFs containing photographs and little or no text.
- ZIP (Flate)  ZIP is a lossless compression algorithm. It is useful for the compression of large images with no loss in quality.

Flate compression (also used by the ZIP format) and JPEG compression can be used for color or grey scale images. CCITT Group 3, 3-2D and 4 as well as Flate can be used for black and white images.

Example:  Apply Flate compression to a TIFF image.

4.4.5 Image Content, Dithering

The content of the image itself has a direct impact on how well it compresses. It seems quite obvious that a plain white image compresses much better than a page filling photograph.
Dithering is an algorithm that arranges the pixels of an image in a way that it creates a visual effect of colors that do not exist in the available colors of the image, such as different grays in a 1-bit black and white image. This complex arrangement of pixels however does not compress well and increase the file size. Disabling dithering therefore reduces the file size. In the 3-Heights™ PDF to Image Converter Shell, dithering is also implemented for color images.

Example: Disable dithering (e.g. for scanned text).

```
-h 0
```

For more information, see chapter Dithering.

## 4.5 Options for Best Results on a Printer

Regular laser printers use a resolution of 600-1200 DPI. For best results on printers, choose a resolution of the same value. In this case, it is also important to generate black and white image and thus set the bits per pixel to 1. So the command would look like this:

Example: Create a bi-tonal, 1200 DPI, CCITT G4 compressed TIFF.

```
pdf2imgR2 -b 1 -d 1200 -g4 input.pdf output.tif
```

An A4 black and white image with a resolution of 1200dpi will be about 1MB in size.

Note: that using such a high resolution in combination with 8bit grey scale or 24bit color images will generate huge files (several hundreds of Megabytes uncompressed, and around 10 Megabytes using JPEG compression).

DPI values larger than 2400 will take a lot of CPU power and memory, we recommend not using values above 2400 for A4 paper size PDF documents.

## 4.6 Color Profiles

A PDF document may contain graphical objects using various different color spaces and the output file of 3-Heights™ PDF to Image Converter Shell may yet use another color space. Therefore often colors have to be converted between different color spaces.

For calibrated color spaces (such color spaces with an associated ICC color profile) the color conversion is well defined. For the conversion of uncalibrated device color spaces (DeviceGray, DeviceRGB, DeviceCMYK) however, the 3-Heights™ PDF to Image Converter Shell requires appropriate color profiles. Therefore it is important, that the profiles are available and that they describe the colors of the device your input documents are intended for.

Note: When setting an alternative color management system such as Neugebauer, no color profiles are required.

If no color profiles are available, default profiles for both RGB and CMYK are generated on the fly by the 3-Heights™ PDF to Image Converter Shell.
4.6.1 Default Color Profiles

If no particular color profiles are set default profiles are used. For device RGB colors a color profile named “sRGB Color Space Profile.icm” and for device CMYK a profile named “USWebCoatedSWOP.icc” are searched for in the following directories:

Windows
1. %SystemRoot%\System32\spool\drivers\color
2. directory Icc, which must be a direct sub-directory of where the pdf2imgR2.exe resides.

Linux and macOS
1. $PDF_ICC_PATH if the environment variable is defined
2. the current working directory

4.6.2 Get Other Color Profiles

Most systems have pre-installed color profiles available, for example on Windows at %SystemRoot%\system32\spool\drivers\color\. Color profiles can also be downloaded from the links provided in the directory bin\Icc\ or from the following websites:

- http://www.color.org/srgbprofiles.html

4.7 Fonts

PDF documents may contain both embedded and non-embedded fonts. When rendering non-embedded fonts the best result can be achieved, if the font is available on the system. Therefore it is important to make sure the Font Directories contain all fonts required.

For more information on how to cope with font issues, please refer to section Font and Text Issues.

4.7.1 Font Cache

A cache of all fonts in all Font Directories is created. If fonts are added or removed from the font directories, the cache is updated automatically.

In order to achieve optimal performance, make sure that the cache directory is writable for the 3-Heights™ PDF to Image Converter Shell. Otherwise the font cache cannot be updated and the font directories have to be scanned on each program startup.

The font cache is created in the subdirectory <CacheDirectory>/Installed Fonts of the Cache Directory.

4.7.2 Microsoft Core Fonts on Linux or macOS

Many PDF documents use Microsoft core fonts like Arial, Times New Roman and other fonts commonly used on Windows. Therefore, it is recommended to install these fonts to your default font directories. Many Linux distributions offer an installable package for these “Microsoft TrueType core fonts”. For instance, on Debian based systems the package is called ttf-mscorefonts-installer.

Alternatively you can download the fonts from here:
http://corefonts.sourceforge.net/
Microsoft has an FAQ on the subject, that covers licensing related questions as well:
https://docs.microsoft.com/en-us/typography/fonts/font-faq

### 4.7.3 Font Configuration File fonts.ini

The font configuration file is optional. It can be used to control the mapping of fonts used in the PDF to fonts pre-installed on the system.

The file fonts.ini must reside at the following location, which is platform dependent:

**Windows:** In a directory named Fonts, which must be a direct sub-directory of where pdf2imgR2.exe resides.

**Unix:** The fonts.ini file is searched in the following locations:

1. If the environment variable PDFFONTDIR is defined: $PDFFONTDIR/fonts.ini
2. ~/.pdf-tools/fonts/fonts.ini
3. /etc/opt/pdf-tools/fonts/fonts.ini

It consists of two sections: `[fonts]` and `[replace]`. Both sections are used to map fonts in the PDF to fonts in the installed font collection on the operating system. This comes into play when the font in the PDF document does not have an embedded font program, or the embedded font is not usable.

The mapping only works if the font types of the specified fonts are matching; e.g. if the font in the PDF is a symbolic font, such as “Symbol” or “ZapfDingbats”, the mapped font must be symbolic too.

The section `[fonts]` is only considered if the font-matcher does not find an appropriate font amongst the existing installed fonts. It is suggested to only use this section.

The section `[replace]` is stronger and applied before the font-matcher. This means a font will be replaced as defined, even if the correctly installed font is available on the system.

**Syntax:** The syntax of the mapping file is as follows

```plaintext
[fonts]
PDF_font_1=installed_font_1{,font_style}
PDF_font_2=installed_font_2{,font_style}
[replace]
PDF_font_n=installed_font_n{,font_style}
```

- **PDF_font_*** is the name of the font in the PDF. This name can be found in one of the following ways:
  - Use any tool that can list fonts. Such as 3-Heights™ PDF Extract or 3-Heights™ PDF Optimizer. Ignore possible prefixes of font subsets. A subset prefix consists of 6 characters followed by the plus sign. For example "KHFOKE+MonotypeCorsiva", in this case only use “MonotypeCorsiva” as font name in the mapping file.
  - Open the document with Adobe Acrobat, use the “MarkUp Text Tool”, mark the text of which you would like to know the font name, right-click it, select “Properties…”

- **installed_font_*** is the font family name of the installed font. To retrieve this name, find the font in the Windows’ font directory and open it by double-clicking. The first line in the property window displays the font family name (this may vary depending on the operating system). The font family name does not include font styles; so an example of a font family name is “Arial”, but not “Arial Italic”.

- **font_style** is an optional style, that is added comma-separated after the font family name.
The style is always one word. Examples of font styles are “Italic”, “Bold”, “BoldItalic”. Omit the font style, if it is “Regular” or “Normal”.

Remove blanks from all font names, i.e. in both the PDF_font_* and the installed_font_*.

Example:

```
[fonts]
Ryumin-Light=MSMincho
GothicBBB-Medium=MSGothic
[replace]
ArialIta=Arial,BoldItalic
```

4.8 Dithering

Dithering is a common means used in images to simulate colors that are not available as actual colors. Its use is best observed in image with a low color depth, where colors or shades of grey need to simulated with other colors (e.g. only black/white pixels).

4.8.1 Remarks

1. All images below have quite a low resolution. As a result the effects of the different dithering types become more obvious. The higher the resolution and the large the number of colors is, the higher the quality of the image.
2. The rendering filter and current zoom level of the PDF viewing application may have an additional impact on how the images below are displayed.

4.8.2 Color Images

<table>
<thead>
<tr>
<th>Color Space</th>
<th>RGB (24 bit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dithering</td>
<td>None</td>
</tr>
<tr>
<td>File Size as PNG</td>
<td>129 kB</td>
</tr>
<tr>
<td></td>
<td>Highest quality</td>
</tr>
<tr>
<td></td>
<td>Highest file size</td>
</tr>
</tbody>
</table>
A 24 bit RGB color image can have up to 16.7 millions of different colors. Dithering does not need to be applied since all required colors exist and none need to be simulated.

| Color Space | 16 colors (4 bit) |
| Dithering   | None             |
| File Size as PNG | 16 kB |
| + Small file size |
| + Works well for images with a small number of colors (artificial images, text) |
| - Does not work well for images with lots of colors (photographic images) - parts of the image can become plain-colored and details get lost |

Color Space   16 colors (4 bit)  
Dithering     Floyd-Steinberg  
File Size as PNG 18 kB  
+ Renders details better  
+ Usually better overall quality, especially in photographic images than without dithering  
- Sometimes generates unwanted artifacts (striking pixels)  
- Larger file size then without dithering

4.8.3 Bi-tonal Images

(The 8 bit image just acts as reference.)
Color Space: Grayscale (8 bit)
Dithering: None
File Size as PNG: 46 kB

Color Space: Grayscale (1 bit)
Dithering: None
File Size as PNG: 2.6 kB

+ Smallest File Size
+ Works well for documents with high contrast (black text on white background)
+ Does not generate artifacts
- Details get lost, because shades of gray are not approximated, but converted to either black or white (in fact images or part of them can become completely black or white)
**Color Space**
Grayscale (1 bit)

**Dithering**
Floyd-Steinberg

**File Size as PNG**
9 kB

**Color Space**
Grayscale (1 bit)

**Dithering**
Halftone

**File Size as PNG**
4 kB

### Grayscale (1 bit) with Floyd-Steinberg Dithering

**Pros**
- Generally higher quality, especially of photographic images
- Can approximate any shade of gray

**Cons**
- Larger file size than without dithering
- Generates artifacts (e.g., a very bright gray paper is approximated by far-spread single black pixels)
- Not well suited for text, unless the color of the text must be reflected

### Grayscale (1 bit) with Halftone Dithering

**Pros**
- Small file size
- Approximates shades of gray

**Cons**
- Not well suited for text or artificial images
4.8.4 Guidelines

As seen in the examples above, different types of dithering behave different for different types of content. Below are some suggestions, which dithering type is normally best for a give type of content:

**Text, OCR**   No dithering

**Artificial images with few colors and no bright colors**   No dithering

**Artificial images with many colors**   Test which dithering type yields the best result

**Photographic images**   Floyd-Steinberg

**Mixed content**   Test which dithering type yields the best result

**Mixed content, high-resolution**   For resolutions above 300 DPI, Floyd-Steinberg almost always yields the best result (exception: for pure black text on white background, use no dithering)

Keep in mind that dithering should only be applied for images with a low color depth, such as black and white (1 bit). Dithering for images with a color depth of 8 bit or higher (256 colors or grey scale) has little to no visual impact.
5 Interface Reference

5.1 Supported Codecs

The following table lists which capabilities of the different codecs are supported by the 3-Heights™ PDF to Image Converter Shell.

<table>
<thead>
<tr>
<th>Codec</th>
<th>Bits per Pixel</th>
<th>Gray</th>
<th>Indexed</th>
<th>Quality</th>
<th>Compression</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIFF</td>
<td>1,2,3,4,8,24</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Raw, Flate, LZW(default), JPEG, Group3, Group3_2D, Group4</td>
</tr>
<tr>
<td>JPEG</td>
<td>8, 24</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>JPEG (lossy only)</td>
</tr>
<tr>
<td>BMP</td>
<td>1, 2, 4, 8, 24</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Raw</td>
</tr>
<tr>
<td>GIF</td>
<td>2-8</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>LZW</td>
</tr>
<tr>
<td>PNG</td>
<td>1-8, 24</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Flate</td>
</tr>
<tr>
<td>JBIG2</td>
<td>1</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>JBIG2 (lossless only)</td>
</tr>
<tr>
<td>JPEG2000</td>
<td>8, 24</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>JPEG2000 (lossless: Q = 100)</td>
</tr>
<tr>
<td>PBM</td>
<td>1-8, 24</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Raw</td>
</tr>
<tr>
<td>EPS</td>
<td>1, 2, 4, 8, 24</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Raw</td>
</tr>
</tbody>
</table>

Codec | The Compression/Decompression Type.

Bits Per Pixel | The supported values for bits per pixel. 1 = bi-tonal, 8 = 256 colors/grey scales, 24 = True Color

Gray | This format supports grey scale.

Indexed | This format supports indexed colors.

Quality | This format supports the setting of a quality parameter.

Compression | Supported compression types.

5.2 Rendering Options

5.2.1 - 1 Create one Image File per PDF Page

1 For palette creation: The number of palette entries is equal to 2 BitsPerPixel where BitsPerPixel is smaller or equal to 8. This means it is possible to create a 3 bits per pixel TIFF or BMP, but the palette size is equal as for 4 bits. However the 3 bits per pixel image will compress better than the 4 bits per pixel image.

2 To create lossless JPEG2000 images, set the quality parameter to 100. For values <100, a lossy compression algorithm is applied.
By default, the 3-Heights™ PDF to Image Converter Shell generates multi-page images if the TIFF format is selected (unless the input PDF document has only one page). To create one TIFF file per PDF page, simply use the option `-1`. This option should also be used for all formats which do not support multi-paging if the input PDF document has more than one page.

**Example:** To generate one TIFF image for every page of the PDF input file, the switch `-1` can be used:

```
pdf2imgR2 -1 input.pdf
```

This will generate a series of one-page TIFF images like this:

```
input_1.tif, input_2.tif, input_3.tif, etc.
```

**Example:** To specify the output name and directory, use a command like this:

```
pdf2imgR2 -1 input.pdf ../output_%d.tiff
```

The output files will then be named

```
output_1.tiff, output_2.tiff, output_3.tiff, etc.
```

### 5.2.2 -b Set the Bits per Pixel

**Set the Bits per Pixel** -b `<n>`

The argument for this parameter depends on the image format (see table Codecs). For JPEG this option has two allowed values: 8 for grey scale and 24 for TrueColor.

**Example:** The following command creates a grey scale JPEG image.

```
pdf2imgR2 -b 8 input.pdf output.jpg
```

When using 1 bit per pixel, it is suggested to disable anti-aliasing (option `-oq`) and set a suitable dithering algorithm (option `-h`).

### 5.2.3 -c Compression Type of TIFF Images

**Compression Type of TIFF Images** -c `<compression>`

Compression options can only be set for TIFF images. For all other image types the compression is defined through the image format (.gif, jpg, etc.).

The default compression is 1 (LZW).

**Note:** Not all image viewer support all compression types for TIFF.
## Compression Table

<table>
<thead>
<tr>
<th>Compression</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>Flate compression (ZIP) is a lossless compression algorithm. It is useful for the compression of large images with no loss in quality.</td>
</tr>
<tr>
<td>g3</td>
<td>CCITT Fax Group 3 is the predecessor to CCITT Fax Group 4, it is a simpler algorithm that normally results in a weaker compression level.</td>
</tr>
<tr>
<td>g3_2D</td>
<td>CCITT Fax Group 3 2D is a 2-dimensional version of the CCITT Group 3 Huffman encoding algorithm.</td>
</tr>
<tr>
<td>g4</td>
<td>CCITT Fax Group 4 is the standard compression for bi-level images (i.e. facsimile).</td>
</tr>
<tr>
<td>j</td>
<td>Joint Photographic Expert Group (JPEG) is a lossy compression algorithm. JPEG provides a high level compression of 8 and 24 bit images. It is best suited for pictures, but not for text images. The option <code>-q</code> can be used to set an image quality.</td>
</tr>
<tr>
<td>j6</td>
<td>TIFF embedded JPEG (6) is an older version of JPEG. Certain (older) image software may support this compression, but not the newer version of JPEG (e.g. Photoshop 8). Allowed in pdf2img only.</td>
</tr>
<tr>
<td>l</td>
<td>Lempel-Ziv-Welch (LZW) is a lossless compression algorithm for images. Please consult the copyright laws of your country prior to using this compression algorithm.</td>
</tr>
<tr>
<td>raw</td>
<td>No compression</td>
</tr>
</tbody>
</table>

### 5.2.4 -cms Set the Color Management Engine

The transformation of colors from one color space to another is performed using a color management engine. Supported engines are:

- **none**: The algorithms specified in the PDF reference are used. This results in the maximum possible contrast.
- **neugebauer**: The Neugebauer algorithm efficiently converts CMYK to RGB. It does not need any color profiles. The results, however, look similar to conversion using color profiles.
- **lcms** (default): Use ICC color profiles. Default profiles are used for all unmanaged device color spaces as described in section [Color Profiles](#).  

When providing a file name, a configurable version of the Neugebauer algorithm is applied. The coefficients can be defined in the text file. The default Neugebauer coefficients are listed below (Red, Green, Blue; Color):

- White: 1.000000, 1.000000, 1.000000
- Cyan: 0.000000, 0.682353, 0.937255
- Magenta: 0.925490, 0.000000, 0.549020
- Yellow: 1.000000, 0.949020, 0.000000
- Black: 0.137255, 0.121569, 0.125490
- CMY: 0.180392, 0.188235, 0.572549
- CMYK: 0.000000, 0.650980, 0.313725
- CY: 0.137255, 0.121569, 0.125490
The Neugebauer algorithm mixes the colors based on the amount of color and the corresponding weighted coefficient. Altering the values for a pure color specifically changes the result for this pure color. The color transition remains smooth.

**Example:** The following command selects the neugebauer color management engine.

```bash
df2imgR2 -cms neugebauer input.pdf output.jpg
```

### 5.2.5 -cn Center Mode

**Center Mode** -cn

Center the PDF. This option is useful in combination with setting page dimensions.

### 5.2.6 -cs Set the Color Space

**Set the Color Space** -cs \( \langle n \rangle \)

This option sets the color space. Supported values are:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Grey-Scale</td>
</tr>
<tr>
<td>2</td>
<td>RGB</td>
</tr>
<tr>
<td>4</td>
<td>CMYK</td>
</tr>
<tr>
<td>7</td>
<td>Indexed</td>
</tr>
<tr>
<td>9</td>
<td>CMYK with K only</td>
</tr>
</tbody>
</table>

### 5.2.7 -d Set the Resolution in DPI

**Set the Resolution in DPI** -d \( \langle \text{dpi} \rangle \)

The default resolution is set to 150 DPI (dots per inch).
This switch is redundant to the specialized options `-dx` and `-dy`, meaning the last option set on the command takes precedence.

**Example:** To set the DPI value to 100 use the option `-d` like this:

```
pdf2imgR2 -d 100 input.pdf
```

### 5.2.8 -dx Set the X-Resolution in DPI

**Set the X-Resolution in DPI**  
- `dx <dpi>`

Set the resolution only for the X-axis. The default resolution is set to 150 DPI.

**Example:** Set the resolution in X to 72 DPI.

```
pdf2imgR2 -dx 72 input.pdf
```

### 5.2.9 -dy Set the Y-Resolution in DPI

**Set the Y-Resolution in DPI**  
- `dy <dpi>`

Set the resolution only for the Y-axis. The default resolution is set to 150 DPI.

**Example:** Set the resolution in Y to 72 DPI.

```
pdf2imgR2 -dy 72 input.pdf
```

### 5.2.10 -f Fit Page Mode

**Fit Page Mode**  
- `f`

Make the PDF fit the page (in either width or height). This option is useful in combination with setting page dimensions.

**Example:** Convert a PDF to a 800 by 600 pixel TIFF image and scale the page of the PDF to fit the page of the image.

```
pdf2imgR2 -s 800 600 -f input.pdf output.tiff
```

### 5.2.11 -fax Convert to Class F

**Convert to Class F**  
- `fax <class F>`

This options creates a Class F TIFF which is used by fax machines. There are two types:
Class F TIFF

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
<th>Equal to these settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>standard</td>
<td>-rp -sp 1728 0 -dx 204 -dy 98 -c g3</td>
</tr>
<tr>
<td>h</td>
<td>high resolution</td>
<td>-rp -sp 1728 0 -dx 204 -dy 196 -c g3</td>
</tr>
</tbody>
</table>

Example: Convert a PDF to a standard Class F TIFF.

```bash
df2imgR2 -fax s input.pdf output.tif
```

5.2.12 -fo Bit Fill Order

**Bit Fill Order**

Set the fill order of bits used in fax compressions.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Most Significant Bit (MSB) first. (default)</td>
</tr>
<tr>
<td>2</td>
<td>Least Significant Bit (LSB) first.</td>
</tr>
</tbody>
</table>

5.2.13 -fs Filter Size

**Filter Size**

This setting is used to enable and parameterize super-sampling, a technique to initially render the image at a higher resolution and then sample it down to the target resolution. As a result of that process the final image appears smoother, i.e. anti-aliased.

Applying super-sampling improves the image quality when rendering at low target resolutions (72 DPI or less); the higher the target resolution the less the visual impact.

This setting requires memory and CPU time quadratically to the ratio, therefore only small values, such as 2 or 3 should be used.

If a too high value (in combination with the original image size) is set, it is ignored.

5.2.14 -g Gray Color Space

**[Deprecated] Gray Color Space**

No longer supported: Use the option `-cs` instead.
5.2.15  \textbf{-h Dithering Mode}

\texttt{Dithering Mode -h \{mode\}}

Set the dithering mode. Allowed values are:

\begin{table}[h]
\centering
\begin{tabular}{|c|p{8cm}|}
\hline
\textbf{Value} & \textbf{Description} \\
\hline
0 & no dithering \\
1 & (Default) Floyd-Steinberg \\
2 & Halftone block \\
3 & Halftone continuous \\
6 & Atkinson dithering is very fast and produces images that can be compressed really well with reasonably good image quality. \\
\hline
\end{tabular}
\end{table}

Dithering provides a better image quality, especially for 1 bit images, at the cost of a larger file size.

\textbf{Example:} Disable dithering for a bi-tonal image.

\begin{verbatim}
pdf2imgR2 -h 0 -b 1 input.pdf output.tif
\end{verbatim}

5.2.16  \textbf{-i Indexed Color Space}

\texttt{[Deprecated] Indexed Color Space -i}

Use the option \texttt{-cs} instead.

5.2.17  \textbf{-m Rendering Mode}

\texttt{Rendering Mode -m \{n\}}

\textbf{Parameter:}

\texttt{\{n\}}

0  Draft mode
1  Quality mode

Set the rendering quality.

5.2.18  \textbf{-oc Disable black point compensation (BPC)}

\texttt{Disable black point compensation (BPC) -oc}
This option disables the use of black point compensation (BPC).

### 5.2.19  -of  Fit Rectangle Paths to Pixel Grid

This option enables fitting of clipping paths that describe exactly one rectangle to the pixel grid.

### 5.2.20  -ofe  Fit Paths to Pixel Grid

This option enables fitting of linear clipping paths to the pixel grid.

### 5.2.21  -oh  Disable Hinting

In the context of text rendering, **hinting** refers to the process of distorting glyph outlines with the goal of producing a clearer and more easily readable rendered image. E.g., horizontal and vertical lines may be moved slightly such that they fall on the pixel grid.

Normally, the rules for performing hinting and a threshold for switching off hinting at low resolutions are contained in a font program. When specifying this option then hinting is switched off entirely.

### 5.2.22  -ohs  Manual Character Size Limit for Hinting

This option allows to override the threshold for switching off hinting at low resolutions.

Hinting is only enabled if the size (vertically or horizontally) of a character to be rendered exceeds the given `<size>` in pixels.

See also **-oh**.

### 5.2.23  -op  Set print mode

This switch enables the print mode.

### 5.2.24  -oq  Disable High Quality Rendering

This option disables anti-aliasing.
5.2.25  -p  Read an Encrypted PDF File

Read an Encrypted PDF File  -p  \(<\text{password}\>

When the input PDF file is encrypted and has a user password set (the password to open the PDF), the password can be provided with the option \(-p\).

Example: If the user password were \(\text{userpwd}\), then the command to read and process the encrypted PDF would look like this:

\[\text{pdf2imgR2} -p \text{userpwd} \text{ input.pdf}\]

When a PDF is encrypted and the user password is not provided or is incorrect, the 3-Heights™ PDF to Image Converter Shell cannot decrypt and read the file. Instead it will generate the error message: \(\text{Password wasn’t correct.}\)

5.2.26  -pbt  Set Page Box Type

Set Page Box Type  -pbt \(<\text{type}\>\)

Set the box type which is used for rendering the page.

The default page box type is \(\text{crop}\).

<table>
<thead>
<tr>
<th>Page Box Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>art</td>
<td>ArtBox</td>
</tr>
<tr>
<td>bleed</td>
<td>BleedBox</td>
</tr>
<tr>
<td>crop</td>
<td>CropBox</td>
</tr>
<tr>
<td>media</td>
<td>MediaBox</td>
</tr>
<tr>
<td>trim</td>
<td>TrimBox</td>
</tr>
</tbody>
</table>

5.2.27  -pi  Print page information

Print page information  -pi

Print page information of all converted pages to standard output. Printed information includes page number, page size in user units (1/72 inch), dimensions of output image in pixels and DPI of output image.

5.2.28  -pg  Set Page Range

Set Page Range  -pg \(<\text{first}\>\ <\text{last}\>\)
With this switch the page range to be converted can be set. Note that the output image format must support multi-page. TIFF and JBIG2 support multi-page.

**Example:** Convert only pages 1 through 3.

```
pdf2imgR2 -pg 1,3 input.pdf output.tif
```

### 5.2.29 -pgs Set of Pages

**Set of Pages** `-pgs <page_set>`

A set of pages can be defined using single pages, ranges of pages and comma-separated combinations thereof.

**Example:** Convert pages 1, 2-4, 6 and 10.

```
pdf2imgR2 -pgs 1,2-4,6,10 input.pdf output.tif
```

Negative numbers can be used to denote a page counting from the back, e.g. `-1` represents the last page of the file.

**Example:** Convert the last two pages of the file.

```
pdf2imgR2 -pgs -2,-1 input.pdf output.tif
```

If a range is given starting from a larger number leading to a smaller number, then the pages will be written in reverse.

**Example:** Convert pages 4, 3 and 2.

```
pdf2imgR2 -pgs 4-2 input.pdf output.tif
```

Note that all of the above ways of addressing can be combined:

**Example:** Supposing a 6-page file, this example would generate pages 3, 2, 1 and 6 in this order.

```
pdf2imgR2 -pgs (3-6,-1 input.pdf output.tif
```

### 5.2.30 -q Set Image Quality

**Set Image Quality** `-q <n>`

Set the image quality of lossy image compressions (such as JPEG). Default: 80. If a compression algorithm supports both lossy and lossless compression, a quality value of 100 will apply lossless compression.

**Example:** Lossy compression with a quality index of 50

```
pdf2imgR2 -q 50 input.pdf output.jpg
```
Example: Lossless compression

```
pdf2imgR2 -q 100 input.pdf output.jp2
```

5.2.31 -ri Ignore Page Rotate Attribute

| Ignore Page Rotate Attribute | -ri |

A PDF document can have a page rotation attribute, that describes if the PDF is to be rotated when displayed (for example when a 90° rotated portrait is displayed as landscape). The PDF to Image Converter by default respects this attribute and rotates pages automatically. Using the switch -ri, the page rotation attribute is ignored.

5.2.32 -rl Rotate Pages to Landscape

| Rotate Pages to Landscape | -rl |

This option rotates all pages to landscape.

5.2.33 -rp Rotate Pages to Portrait

| Rotate Pages to Portrait | -rp |

This option rotates all pages to portrait.

5.2.34 -s Set Width and Height of Image in Points

| Set Width and Height of Image in Points | -s \(<w>\) \(<h>\) |

When not specified, the image will have the same dimensions as the input PDF (specifically its CropBox). To set the dimensions manually, use this option, where \(<w>\) is the width and \(<h>\) the height. If either of the dimensions is set to 0, the value will be computed proportionally based on the other value.

Example: The following command will generate an image that is 400x300 points.

```
pdf2imgR2 -s 400 300 input.pdf
```

5.2.35 -sa Set Width and Height in Pixel and Preserve Ratio

| Set Width and Height in Pixel and Preserve Ratio | -sa \(<w>\) \(<h>\) |

The option -sa has the same effect as -sp, but the aspect ratio is preserved. This means you can specify the maximum size allowed, the image will then be scaled to fit one of the dimensions. (Example: a 400 by 400 points PDF is converted with the option -sa 600 800. The ratio of the input file is preserved, which is 1:1. The maximum that fits in 600 by 800 pixels is therefore a 600 by 600 pixel image).
5.2.36  -so  Page Offset in Points

Page Offset in Points  -so  <x> <y>

Set the offset of the image in points. The default offset is the CropBox's.

5.2.37  -sp  Set Width and Height of Image in Pixel

Set Width and Height of Image in Pixel  -sp  <w> <h>

This option can be used to set the dimensions of the image in pixels manually. If either of the dimensions is set to 0, the value will be calculated proportionally based on the other value.

Example: The following command creates a file with a width of 1024 pixels, the height is calculated proportionally.

\[ \text{pdf2imgR2}  \ -sp \ 1024 \ 0 \ \text{input.pdf} \]

5.2.38  -t  Set Threshold When Dithering is Disabled

Set Threshold When Dithering is Disabled  -t <threshold>

When producing bi-tonal images, e.g. by the options -b 1, -g3 or -fax, then the dithering mode is set with the -h switch. If "no dithering" is selected (-h 0) then the conversion of color or grayscale images is done by applying a threshold. All pixels with brightness above the threshold are converted to white and all others to black.

The switch -t can be used to set a custom threshold. The allowed range is 0 (all white) to 255 (all black). The default value is 181.

5.3  General Options

5.3.1  -v  Verbose Mode

Verbose Mode  -v

This option turns on the verbose mode.

5.3.2  -lk  Set License Key

Set License Key  -lk <key>

Pass a license key to the application at runtime instead of using one that is installed on the system.

\[ \text{pdf2imgR2}  \ -lk \ X-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX \ldots \]

This is required in an OEM scenario only.

5.4  Return Codes

All return codes other than 0 indicate an error in the processing.
## Return Codes

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Success.</td>
</tr>
<tr>
<td>1</td>
<td>Couldn't open input file.</td>
</tr>
<tr>
<td>2</td>
<td>PDF output file could not be created.</td>
</tr>
<tr>
<td>4</td>
<td>PDF input file is encrypted and password is missing or incorrect.</td>
</tr>
<tr>
<td>5</td>
<td>Extraction error either due to corrupt input PDF or failure when storing an extracted file.</td>
</tr>
<tr>
<td>5</td>
<td>Rendering error.</td>
</tr>
<tr>
<td>10</td>
<td>License error, e.g. invalid license key.</td>
</tr>
</tbody>
</table>
6 Troubleshooting

6.1 Output

6.1.1 Generated Files Have a Large Size

Read in the chapter User’s Guide How to Reduce the File Size.

6.1.2 Images Are of Too Low Quality

Increase the resolution to increase to pixel mass. This is done using the option \-d. For lossy compression algorithms, such as JPEG, increase the quality parameter, e.g. \-q 85.

6.1.3 Image Does Not Contain the Whole Content

This can happen when the option \-s is used to set dimensions that have a different ratio than the original dimensions. To automatically make the page fit the new dimensions, use the option \-f. Alternatively ensure the page dimensions of the image are large enough to hold the complete page.

6.1.4 Colors Are Gone

The option \-b allows you to set the bits per pixel. JPEG 8 bit is always grey scale, since indexed colors are not supported for this format. For TIFF and GIF, the indexed colors need to be enabled if 8 bit is selected. This is done with the option \-cs 7.

6.2 Font and Text Issues

1. For issues with text using non-embedded fonts:
   1. Ensure the required fonts are available on the system (see Chapter Fonts).
   2. See Section Handle Non-Embedded Fonts.

6.2.1 Handle Non-Embedded Fonts

Font Replacement Strategy

This section describes the exact behavior of font handling of the rendering engine. It is rather technical and it is not required to be understood in order to properly use the software.

The following steps are performed sequentially in the search of a font. If a font is found, the search is stopped; otherwise the next step is performed.

1. If the font is not embedded:
a. If the font name appears in the [replace] section in the configuration file fonts.ini the name is replaced and looked up in the installed font collection.
b. If it is a standard font\(^3\) it is replaced by the equivalent TrueType font name and it is looked up in the installed font collection.
c. If the font name appears in the [fonts] section in the configuration file fonts.ini the name is replaced and looked up in the installed font collection.
d. If the font has "Italic" or "Bold" in its name the font without these styles is looked up in the installed font collection.
2. If a font name is looked up in the installed font collection then the name comparison is performed as follows:
   a. PostScript name.
   b. TrueType name without blanks (a missing style is interpreted as "Regular" or "Normal").
   c. TrueType name without modifications.
3. If a font from the installed font collection matches the metrics of the font, the installed font is used.
4. If the font is a CID font using a specific character collection, e.g. “Japan1”, an installed font that contains the required code pages is used.
5. If the font is a non-symbolic simple font, a font program with the font metrics required is created dynamically.

\(^3\) e.g. Times-Roman, Helvetica, Courier
7 Version History

7.1 Changes in Version 6

- **Improved** search algorithm for installed fonts: User fonts under Windows are now also taken into account.

Shell `pdf2imgR2`

- **New** option `-pbt` to select the box which is used for rendering the page.

7.2 Changes in Version 5

- **New** additional supported operating system: Windows Server 2019.

Shell `pdf2imgR2`

- **New** option `-ofe` to fit linear clipping paths to pixel grid.

7.3 Changes in Version 4.12

- **Improved** the rendering quality of small text using Type3 fonts (bitmap fonts).
- **Improved** the quality of low-pass filtered images, if the default Gauss algorithm is used. Note that for creating bitonal output images, the option `-ofb` is recommended.
- **Improved** the rendering speed for documents that have resources with circular references.
- **New** HTTP proxy setting in the GUI license manager.

7.4 Changes in Version 4.11

- **New** support for reading PDF 2.0 documents.
- **Improved** search in installed font collection to also find fonts by other names than TrueType or PostScript names.

Shell `pdf2imgR2`

- **Improved** option `-pgs` to also address pages from the back of the document as well as reordering pages freely.

7.5 Changes in Version 4.10

- **Improved** rendering engine R2 performance when using Type 3 fonts.
- **Improved** robustness against corrupt input PDF documents.
- **Improved** annotation appearance generation for polyline, squiggly, and stamp annotations.
- **Removed** the font ZapfDingbats.ttf from the product kit as it is not required anymore.

### 7.6 Changes in Version 4.9

- **Improved** support for and robustness against corrupt input PDF documents.
- **Improved** repair of embedded font programs that are corrupt.
- **New** support for OpenType font collections in installed font collection.
- **Improved** metadata generation for standard PDF properties.

### 7.7 Changes in Version 4.8

- **Improved** creation of annotation appearances to use less memory and processing time.
- **Added** repair functionality for TrueType font programs whose glyphs are not ordered correctly.
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Contact

PDF Tools AG
Kasernenstrasse 1
8184 Bachenbülach
Switzerland
http://www.pdf-tools.com
pdfsales@pdf-tools.com