Oscillated Recall Technology

ImgScan

Image Data Scanning Software

User Manual

Version 1.00

Oscillated Recall Technology Inc.
2-1-6 Sengen C-A-10, Tsukuba R&D Support Center, Tsukuba-shi, Ibaraki 305-0047, Japan
www.or-tech.co.jp

About this manual

This manual describes how to install and run ImgScan Version 1.00, which parameters it accepts, what it reports, and how to solve common problems. It is written for operators who convert scanned or rendered images of printed circuit boards, photomasks and similar artwork into CAD data, and for engineers who call ImgScan from scripts or other programs.

Conventions used in this manual:

- `Monospace` marks file names, folder names, commands and parameters exactly as you type them.
- **Bold** marks names of buttons, menus and important terms.
- *Note*, *Important* and *Tip* boxes give additional information. *Important* marks information that prevents data loss or a wrong result.

Document history

Version	Date	Changes
1.00	November 2026	First edition.

Trademarks

ImgScan is a product of Oscillated Recall Technology Inc. Microsoft and Windows are trademarks of Microsoft Corporation. ODB++ is a trademark of Siemens. LinkCAD is a trademark of its respective owner. All other names are the property of their respective owners.

Contents

1. Introduction 4
1.1 Typical applications 4
1.2 Main features 4
1.3 How ImgScan works 4
2. System requirements 5
3. Installation 6
3.1 Installing ImgScan 6
3.2 Folder structure 6
3.3 Path length for ODB++ export 6
3.4 Licence 6
4. Running ImgScan 7
4.1 Command syntax 7
4.2 Parameters 7
4.3 Choosing the parameters 7
5. Processing modes 9
5.1 Parallel processing 9
5.2 Several jobs at the same time 9
6. Example 10
6.1 Prepare the folders 10
6.2 Write the batch file 10
6.3 Run the conversion 10
7. Output 12
7.1 Output formats 12
7.2 Reproducibility 12
7.3 Temporary files 12
8. Exit codes and messages 13
8.1 Exit codes 13
8.2 Error messages 13
9. Using ImgScan with LinkCAD 14
10. Troubleshooting 15
11. Support 16

1. Introduction

ImgScan converts large raster images into vector CAD data. It reads a monochrome or grayscale image, separates the artwork from the background, traces the outline of every shape and writes the result as DXF, Gerber or ODB++ data.

Ordinary image tools load a whole picture into memory and therefore stop at the size limits of Microsoft Windows and of common image libraries. ImgScan instead divides the image into bands, processes each band separately and joins the results. Images of several hundred megabytes, for example a complete printed circuit board panel scanned at 1 µm per pixel, can therefore be converted in one run.

1.1 Typical applications

- Recovering CAD data for a printed circuit board or a photomask when only a scan or a photograph is available.
- Converting images from automated optical inspection (AOI) into Gerber or ODB++ data for comparison with the design.
- Converting rendered artwork into DXF for mechanical CAD.

1.2 Main features

- Input: Windows bitmap (`.bmp`) and TIFF (`.tif`) images.
- Output: DXF, Gerber (RS-274X) and ODB++ (`.tgz`).
- Processing in bands, for images far beyond the size limits of ordinary image tools.
- Parallel processing on several processor cores.
- Command-line operation for batch files, scripts and integration into other software.
- Clear exit codes, so a calling program can tell a successful run from a failed one.

1.3 How ImgScan works

A run has four stages. ImgScan prints a message at the start of each stage:

Stage	Message	What happens
1. Loading	`Iamge Data loading starts`	The image is read and checked.
2. Raster and vector processing	`Processing nn %`	The image is cut into bands of `BDWIDTH` pixels. Each band is thresholded, cleaned of small specks and traced into polygons.
3. Merging	`Data Cleaning starts`	The polygons of all bands are joined into one drawing; shapes cut at a band border become whole again.
4. Export	`Image2CAD conversion was done`	The drawing is written in the requested CAD format.

2. System requirements

Item	Requirement
Operating system	Microsoft Windows 10 or 11, 64-bit
Processor	x64 processor. ImgScan uses all cores; more cores shorten the run time.
Memory	8 GB or more recommended
Disk space	Free space on the drive of the %TEMP% folder of about ten times the size of the input image, plus the size of the output file
Program folder	A path without spaces or commas. For ODB++ export, the full path of the program folder must be short (see 3.3).
Licence	An ImgScan licence for the computer (see 3.4)

3. Installation

3.1 Installing ImgScan

ImgScan needs no installer. It is delivered as a folder that you copy to the computer:

1. Copy the delivered `ImgScan` folder to a local drive, for example to `C:\ImgScan`.
2. Check that the path of the folder contains no spaces and no commas.
3. Open the folder and check that it contains the folders `Exe`, `In` and `Out` and the batch file `Run.bat`.

3.2 Folder structure

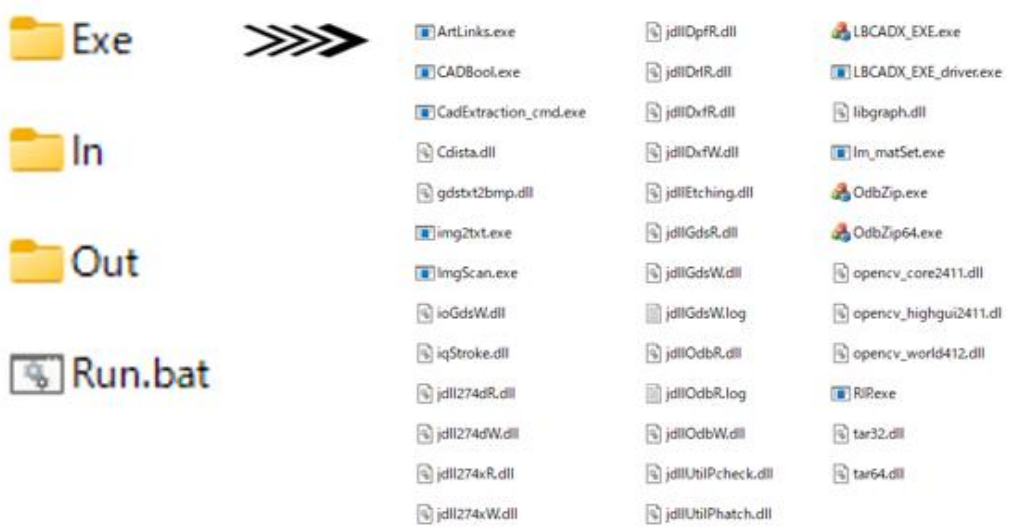


Figure 1 – The ImgScan folder and the contents of the Exe folder

Folder or file	Contents
`Exe`	`ImgScan.exe` and the programs and libraries it uses. Do not move, rename or remove any file in this folder.
`In`	Suggested location for the input images
`Out`	Suggested location for the CAD files that ImgScan writes
`Run.bat`	Example batch file that starts a conversion (see chapter 6)

Important: ImgScan finds its helper programs through the relative path `Exe\`. Always start ImgScan with the `ImgScan` folder as the current folder, as `Run.bat` does. Started from another folder, ImgScan cannot find its helper programs and the conversion fails.

3.3 Path length for ODB++ export

For ODB++ export, the full path of the file `Exe\OdbZip64.exe` must be shorter than 128 characters. Install ImgScan close to the root of a drive, for example in `C:\ImgScan`, if you export ODB++. If the path is too long, ImgScan stops with exit code 1028 (see chapter 8).

3.4 Licence

ImgScan is licensed for a specific computer and for a limited period. Oscillated Recall Technology Inc. renews the licence before it ends. If ImgScan reports `License is not set to this PC`, the licence is missing, belongs to another computer or has expired. Contact your supplier.

4. Running ImgScan

4.1 Command syntax

ImgScan is a command-line program. Each parameter is written as `NAME=value`; parameters are separated by spaces:

```
Exe\ImgScan.exe IMAGE=<image> OUTPUT=<CAD file> EXPORT=<format>
                PIXEL=<µm> THRESH=<0-255> TRASHNUM=<pixels>
                ACCURACY=<1|2> BDWIDTH=<pixels> END
```

- Parameter names are written in capital letters.
- The order of the parameters does not matter.
- `END` marks the end of the parameter list. ImgScan ignores everything after it.
- Relative paths are relative to the current folder, which must be the `ImgScan` folder.
- Paths must not contain spaces or commas. ImgScan reads `=` and `,` as separators, so quoting a path does not help.

4.2 Parameters

Parameter	Value	Description
`IMAGE`	Path	The image to convert: a `.bmp` or `.tif` file. Required.
`OUTPUT`	Path	The CAD file to write. The folder must exist. An existing file of the same name is replaced. Required.
`EXPORT`	`DXF`, `GERBER` or `ODB++`	The CAD format to write. Use the matching file extension in `OUTPUT`: `.dxf`, `.gbr` or `.tgz`. Required.
`PIXEL`	Number, µm	The size of one pixel in micrometres, for example `1.0` for an image scanned at 1 µm per pixel. Sets the scale of the CAD data. Default: `1.0`.
`THRESH`	0 to 255	The gray level that separates artwork from background. Pixels on one side of this value become shapes.
`TRASHNUM`	Pixels	Specks smaller than this number of pixels are removed as noise. `0` keeps everything.
`ACCURACY`	1 or 2	The resolution of the raster and vector processing. `2` gives the more accurate outline.
`BDWIDTH`	Pixels, up to 2000	The width of one processing band. Larger bands need more memory and give fewer band borders.
`DEBUG`	(no value)	Prints the parameters and keeps the temporary files for analysis (see 7.3). For troubleshooting only.
`END`	(no value)	Marks the end of the parameter list.

Note: ImgScan checks `ACCURACY` and `BDWIDTH` before it starts. A value outside the range stops the run with `Accuracy Level should be 1 or 2` or `BandWd shpould be 2000 or less`.

4.3 Choosing the parameters

To …	Change
get the right size in CAD	Set `PIXEL` to the real pixel size of the scan. Check one known dimension in the result.

To …	Change
keep thin lines that disappear	Move THRESH towards the background level, or lower TRASHNUM.
remove dust and noise	Raise TRASHNUM.
get smoother, more accurate edges	Use ACCURACY=2.
reduce memory use	Lower BDWIDTH.

Start with the values of the example in chapter 6 (THRESH=80, TRASHNUM=3, ACCURACY=2, BDWIDTH=2000) and adjust them on a small part of the image before you convert a large one.

5. Processing modes

5.1 Parallel processing

ImgScan uses several processor cores for its processing. There is no limit on the number of cores, and no parameter is needed.

5.2 Several jobs at the same time

You can run several conversions at the same time, for example from several batch files. Each run uses its own temporary folder (see 7.3).

- Give each job its own `OUTPUT` file. Two jobs that write the same file make one of them fail.
- Each job needs memory and temporary disk space of its own. Start only as many jobs as the computer can hold.

6. Example

This example converts the image `Test.bmp` into the Gerber file `Out_Test.gbr`.

6.1 Prepare the folders

Copy the image into the `In` folder:

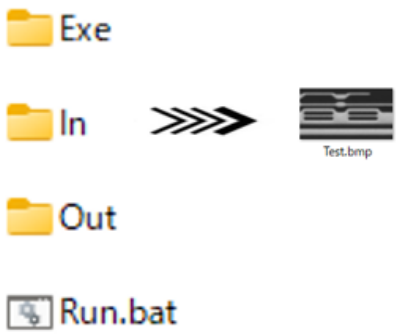


Figure 2 – The image Test.bmp in the In folder

6.2 Write the batch file

Write `Run.bat` in the `ImgScan` folder. The `^` at the end of a line continues the command on the next line:

```
@echo off
cd /d "%~dp0"
Exe\ImgScan.exe ^
  IMAGE=In\Test.bmp ^
  OUTPUT=Out\Out_Test.gbr ^
  EXPORT=GERBER ^
  PIXEL=1.0 ^
  THRESH=80 ^
  TRASHNUM=3 ^
  ACCURACY=2 ^
  BDWIDTH=2000 ^
  END
if %errorlevel% neq 0 (echo Conversion FAILED) else (echo Conversion OK)
pause
```

`cd /d "%~dp0"` makes the folder of the batch file the current folder, so the batch file also works when it is started from another folder. `if %errorlevel% neq 0` tests the exit code (see 8.1).

> **Important:** Do not test with `if errorlevel 1`. It means "1 or higher", and ImgScan reports a failure with -1, so the test would report success.

6.3 Run the conversion

Double-click `Run.bat`. ImgScan shows its progress:

```
Iamge Data loading starts
Processing 25 %
Processing 50 %
Processing 75 %
Processing 100 %
Data Cleaning starts
Image2CAD conversion was done
Conversion OK
```

The Gerber file `Out_Test.gbr` is now in the `Out` folder. To export DXF or ODB++ instead, change `EXPORT` and the extension of `OUTPUT`:

Format	EXPORT	OUTPUT
DXF	EXPORT=DXF	OUTPUT=Out\Out_Test.dxf
Gerber	EXPORT=GERBER	OUTPUT=Out\Out_Test.gbr
ODB++	EXPORT=ODB++	OUTPUT=Out\Out_Test.tgz

7. Output

7.1 Output formats

Format	Contents
DXF	Closed polylines on one layer. Units: millimetres.
Gerber	Extended Gerber (RS-274X) with filled regions. Coordinates in millimetres, format 4.6.
ODB++	A compressed ODB++ job (`.tgz`) with one layer.

7.2 Reproducibility

Two runs on the same image can give files that differ by single points of 1 µm along the edge of the image or of a band. The difference comes from the outline-tracing library and has no practical effect on printed circuit board data.

7.3 Temporary files

ImgScan writes its working data to a folder `IMGSCAN_<process number>_<n>` in the Windows temporary folder (`%TEMP%`). This folder can reach about eight times the size of the input image: 72 MB for a 9 MB image. ImgScan deletes it at the end of the run. With `DEBUG`, ImgScan keeps the folder so that it can be analysed.

The files `jdllGdsW.log` and `jdllOdbR.log` in the `Exe` folder are written by a library that ImgScan uses. They can be ignored.

8. Exit codes and messages

8.1 Exit codes

ImgScan returns an exit code that a batch file or a calling program can test. Only exit code 0 means that a new output file was written.

Exit code	Meaning
0	The conversion succeeded. The output file is new.
-1	The conversion failed. No output file is left.
1028	ODB++ export is not possible because the path of the program folder is too long (see 3.3).

Important: After a failed run, ImgScan deletes the output file, so an old file of the same name cannot be mistaken for a new result. Always test the exit code before you use the output.

8.2 Error messages

Messages are shown exactly as ImgScan prints them, including their spelling, so that you can search for them.

Message	Cause and remedy
`License is not set to this PC`	No valid licence for this computer, or the licence has expired. Contact your supplier.
`Accuracy Level should be 1 or 2`	`ACCURACY` is out of range. Use 1 or 2.
`BandWd shpould be 2000 or less`	`BDWIDTH` is too large. Use 2000 or less.
`Output folder does not exist or Output file ( … ) is opened by the other program`	Create the output folder, or close the program that has the output file open, then run again.
`ODB++ export needs a shorter program folder`	Move the `ImgScan` folder closer to the root of the drive (see 3.3).
`Image data Importing was failed`	The image cannot be read: the file does not exist, the path contains a space, or the image uses an encoding ImgScan cannot read. Save the image as an uncompressed 8-bit `.bmp` and try again.
`CAD conversion was failed Intermediate Cad conversion nwas failed`	The processing of a band failed. Check the free space in `%TEMP%` and the free memory, or lower `BDWIDTH`.
`Post Merging was failed`	The bands could not be joined. Check the free space in `%TEMP%`.
`No output file ( … )`	The export step finished but wrote no file. Check the free space and the permissions of the output folder.
`ImageScan was failed`	Final message of every failed run. The message before it names the cause.
`Internal process was failed`	A helper program in `Exe` failed. Check that the `Exe` folder is complete and that ImgScan was started from the `ImgScan` folder.
`CAD conversion (Pre-process) was failed`	The preparation of the bands failed. Check the free space in `%TEMP%`.

9. Using ImgScan with LinkCAD

LinkCAD reads the files that ImgScan writes. Use LinkCAD to check the result, to combine it with other layers, or to convert it into a format that ImgScan does not write, for example GDSII or OASIS.

1. Convert the image with ImgScan, for example to Gerber (`EXPORT=GERBER`).
2. Start LinkCAD. Select **Gerber** as the import format and the target format as the export format, for example **GDSII**.
3. Open the file that ImgScan wrote. The pixel size set with `PIXEL` gives the real dimensions; no scaling is needed.
4. Check the result in the LinkCAD viewer and finish the conversion.

Both steps can run in one batch file. LinkCAD runs only if ImgScan succeeded:

```
cd /d "%~dp0"
Exe\ImgScan.exe IMAGE=In\Test.bmp OUTPUT=Out\Out_Test.gbr EXPORT=GERBER ^
  PIXEL=1.0 THRESH=80 TRASHNUM=3 ACCURACY=2 BDWIDTH=2000 END
if %errorlevel% neq 0 exit /b 1
"C:\Program Files\LinkCAD 11\linkcad.exe" -i Out\Out_Test.gbr ^
  --input-format "Gerber RS-274X" -o Out\Out_Test.gds --output-format GDSII ^
  --quit --no-save-settings
```

For DXF output use `--input-format DXF`; for ODB++ output use `--input-format ODB++ --OdbppInStep step`.

> **Tip:** LinkCAD can import small images directly. Use ImgScan for images that are too large for a direct import, and LinkCAD for everything that follows. See docs.linkcad.com for the LinkCAD documentation.

10. Troubleshooting

Problem	Solution
The window of `Run.bat` closes immediately	Add `pause` as the last line of the batch file to read the messages.
ImgScan cannot find its helper programs	Start ImgScan from the `ImgScan` folder. Add `cd /d "%~dp0"` at the start of the batch file.
A path with spaces does not work	Move the image, the output folder or the `ImgScan` folder to a path without spaces.
Thin lines are missing in the result	Adjust `THRESH` and lower `TRASHNUM` (see 4.3).
The result is too large or too small	Set `PIXEL` to the real pixel size of the image.
The run is slow	Close other programs, make sure `%TEMP%` is on a local fast drive, and do not run more jobs at the same time than the computer has cores.
The disk becomes full	Each run needs free space in `%TEMP%` of about ten times the size of the image. Delete `IMGSCAN_*` folders that are left after a crash or after `DEBUG` runs.

11. Support

For questions about ImgScan, licences and updates, contact:

Oscillated Recall Technology Inc.

2-1-6 Sengen C-A-10, Tsukuba R&D Support Center, Tsukuba-shi, Ibaraki 305-0047, Japan
Web: www.or-tech.co.jp
Telephone: +81 29 828 5825

Please include the command line, all messages ImgScan printed, and, if possible, the image or a part of it.