

User's Guide

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1. Scope

This document is applicable to the **tablet PCs and mobile computers powered by Windows 7, 8 & 8.1** and **2DTG's Decoding libraries for Data Matrix, QR Code (including Micro QR) and 1D (Linear barcodes, GS1 Databar (former RSS14 family), and Pharmacode)** symbologies.

Linear symbologies include: EAN 13, EAN 8, UPCE, Code 39, Code 128, Interleaved 2 of 5 and Codabar

Scan Wedge types of barcode decoders (**BD_Office** and **BD_SW**) are ready for incorporation into the customer application. **Barcode Reader** designed to demonstrate the software performance on Tablet PC.

The following libraries are used for building decoder package:

- [Data Matrix, Enterprise Edition \(DM_EP\)](#)
- [QR Code \(QRC_PRO\)](#)
- [1D BarCode \(1D_EP\)](#) – with exception of postal codes

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Library features are the same as for the regular Windows powered PCs. They are described in detail in the corresponding [User's Guides](#). However, Quality Parameters (QP) assessment feature is not included. It can be delivered per customer request.

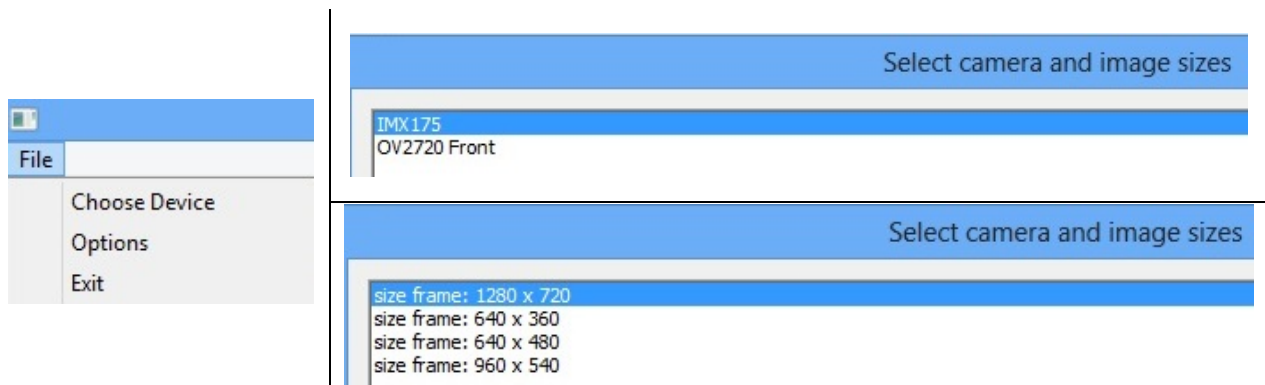
2. Decoder package composition and Deployment

Barcode package is notated as **BD_v.xx.xx.zip**, and includes the following applications/files:

- **Barcode_Reader.exe** - Decoding Demo application to demonstrate libraries decoding performance; returns result to the pop-up text box.
 - **BD_Office.exe** – Decoding application for data collection systems; returns result to the MS Excel, MS Word, MS Word Pad, opened in the background.
 - **BD_SW.exe** – Decoding application for data collection systems; returns result to the any application window opened in the foreground.
 - **OptionsEdit.dll** – decode options setting file.
1. Download **Barcode Decoder** and extract all files to a designated folder on your PC.
 2. When you run any of the decoding programs for the first time on your computer click “**Evaluate ...**“ if you wish to use it in a trial mode or click “**Purchase ... Online**“ if you are ready to purchase and follow online [activation dialog](#) (Trial mode is fully functional, but it’s limited to 30 days)
 3. You can activate/license any one of the three applications above, and then all of them would be activated.

3. Settings

When you start any of the applications above for the first time, you may want to choose the camera (**File -> Choose Device** menu) and its resolution for your application (ASUS VivoTab Smart Tablet PC is shown as an example):



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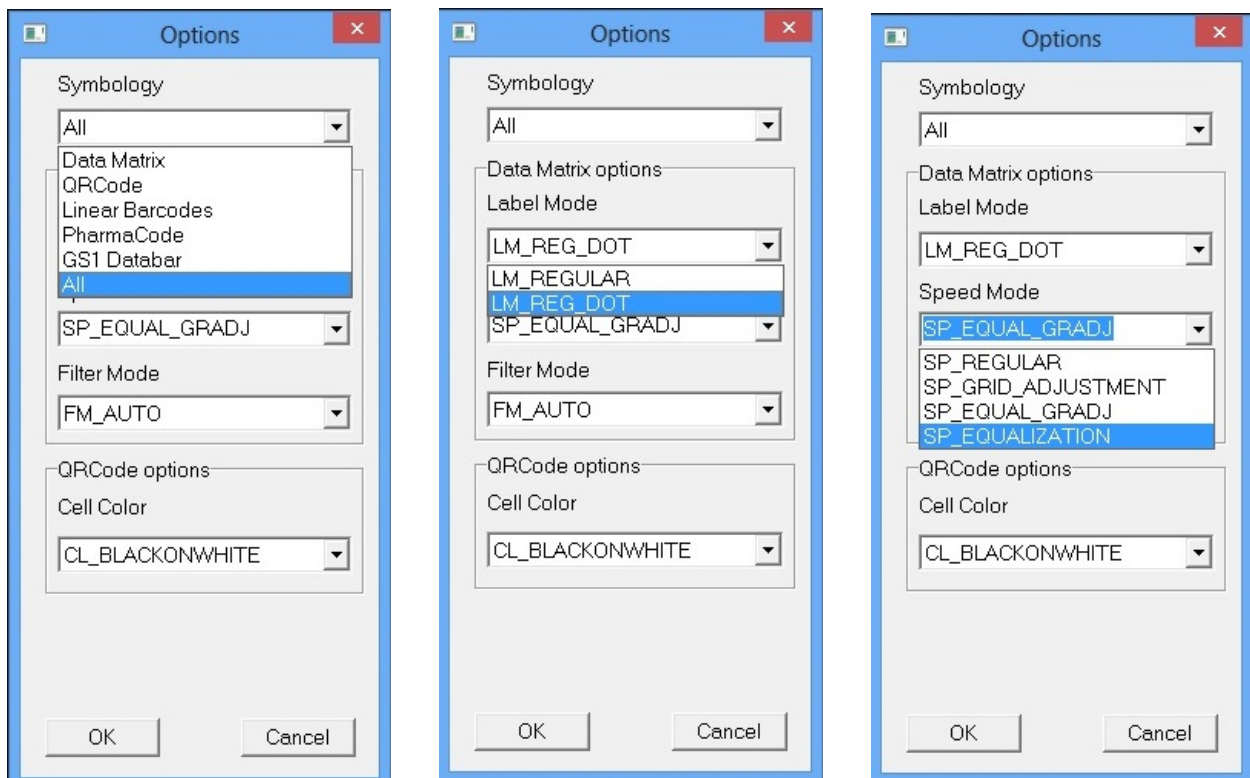
You can change this selection at any time later if you need to.

File -> Options menu allows to choose decoder (Data Matrix, QR Code, Linear, GS1 Databar, Pharmacode or “ALL”) and some particular decode settings for Data Matrix decoder or QR Code decoder (default – “Data Matrix”).

Option “**ALL**” includes all codes except GS1 Databar and Pharmacode. However, it is recommended to use this option only if you really do not know the type of the code you are dealing with, because decode time may increase substantially compare with particular setting.

For Data Matrix symbology you can further adjust three settings (see pictures below):

- **Label Mode** – Regular, “Reg +Dot (Dot Peen)” (default) – allows to choose between the regular matrix and Dot Peened one.
- **Speed Mode** – Regular, “Regular + Grid Adjustment”, “Regular + additional Equalization”, “Reg +Equal+GrAdj” (default) – “Regular” means fastest decoding, “Reg +Equal+GrAdj” means the most robust decoding.
- **Filter Mode** – Adaptive (Auto) Filter, SharpMask, BWR, “SharpMask + BWR” (default – “AUTO”; see Section 6 for detail)



For QR Code – only one setting is available allowing – **Cell Color** - differentiation between “Black-on-White” or “White-on-Black” symbol reading.

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No additional settings are available for Linear, Pharmacode and GS1 Databar symbologies.

Default settings are normally good for the majority of samples. However, for some samples – particularly DPM ones (Section 3.3) – you may need to adjust them.

4. Running the Applications

There are three **Barcode Decoder** applications designed to meet different decode objectives: **BD_Office.exe**, **BD_SW.exe** and **Barcode_Reader.exe**.

BD_Office and **BD_SW** are ready for the use in data collection, inventory management and “track and trace” systems allowing decoding and parsing data into “desired place” in it.

BD_Office shall be considered as a special case solution of a broader Scan Wedge type (**BD_SW**) program. The size of Tablet PC does not normally allow monitoring a barcode position in the camera’s Field of View while scanning (in “Scan Wedge”). **BD_Office**, however, provides such capabilities, while ensuring seamless integration with the most popular MS Office applications (MS Excel and MS Word).

To run the application:

- Select **BD_Office.exe** to be able to automatically paste decoded data directly to the MS Excel, MS Word, MS Word Pad applications installed on the terminal (application should be opened in the foreground at this time), or
- Select **BD_SW.exe** to be able to send decoded data to any foreground application as keystrokes, or
- Select **Barcode_Reader.exe** if you just want to see the decode result on the terminal screen (inside the pop-up text box).

When an application is open, Click/Tap somewhere within the application (Barcode Decoder) window to activate camera. The Decoder will automatically scan and decode symbol presented in the Field of View.

Decoder (and camera) will stop automatically when decode is successful. Otherwise, Click/Tap somewhere within the application window again to stop reading (normally after couple seconds) and adjust settings.

To close application - tap “x” in the upper-right corner of the Decoder’s window. Alternatively - tap Decoder’s name in WE window – “pop-up” message box will ask to confirm that you want to close - choose “Yes”.

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Important!

Only one application using camera can be running at the same time. If you want to launch another application using camera, please, close the running one first.

Note: all applications can be controlled by the Hot Keys (Section 4.2) as well.

4.1 **BD_Office.exe**

- Launch the **BD_Office.exe** program - tap file name in Windows Explorer - a blank Decoder's window opens.
- Position the device over the barcode to ensure it's in the camera's Field of View (preferably close to its center). Click/Tap somewhere in the application (Barcode Decoder) window to activate camera. The Decoder will automatically scan and decode symbol presented in the Field of View - you can monitor the image quality while changing the reading distance and angle.

For parsing decode data into MS Excel, MS Word, MS Word Pad:

- Launch MS application while keeping **BD_Office.exe** running.
- Place (click/tap) cursor into the position where you want the decode data to be parsed.
- Switch to **BD_Office.exe** keeping MS Office application running in the background.
- Read the symbol (Click/Tap somewhere in the application (Barcode Decoder) window).
- Decoded data will be parsed to the MS application running in the 'background' and its window will pop-up to the foreground. Each new read will be placed on a new line/cell.

4.2 **BD_SW.exe**

This application is functionally a Scan Wedge utility – it sends data from the Decoder to the foreground application as keystrokes (as if the data were entered via a keyboard). The foreground application could be **ANY** software application whose window is currently active while the Decoder is running.

Important!

This application does not have an application window - Hot Keys should be used for its operation.

Hot Keys:

CTRL+D – Start/Stop Decoder

CTRL+O – access to the Options menu

CTRL+C – access to the camera menu

Overall this application operates the same way as **BD_Office.exe** with the exception that you cannot monitor the image in the Decoder's window while scanning and the application, where you want to send the data to, should be running in the foreground.

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Also, to close application:

- tap Decoder's name in WE window – “pop-up” message box will ask to confirm that you want to close - choose “Yes”, or
- use Windows's “Task Manager”

4.3 Barcode_Reader.exe

This application is particularly useful when you do not need to parse data into the data collection system but want just to see the decode result. The result is printed to the “pop-up” Message Box. Like with the **BD_Office.exe** you can monitor the image while finding the best scanning position for your device.

- Launch the program - tap file name in Windows Explorer - a blank Decoder's window opens.
- Position the device over the barcode to ensure it's in the camera's Field of View and close to its center. Click/Tap somewhere in the application (Barcode Decoder) window to activate camera. The Decoder will automatically scan and decode symbol presented in the Field of View - you can monitor the image quality while changing the reading distance and angle.

The decode result is printed to the “pop-up” Message Box along with decode time and number of decode cycles:

- Tap/click “OK” in the Message Box to make it disappear.
- Click/Tap somewhere in the application (Barcode Decoder) window again for new decoding.

4.4 Reading Technique and Resolution

Tablet PC normally comes with powerful auto-focus camera, allowing for multiple resolution options.

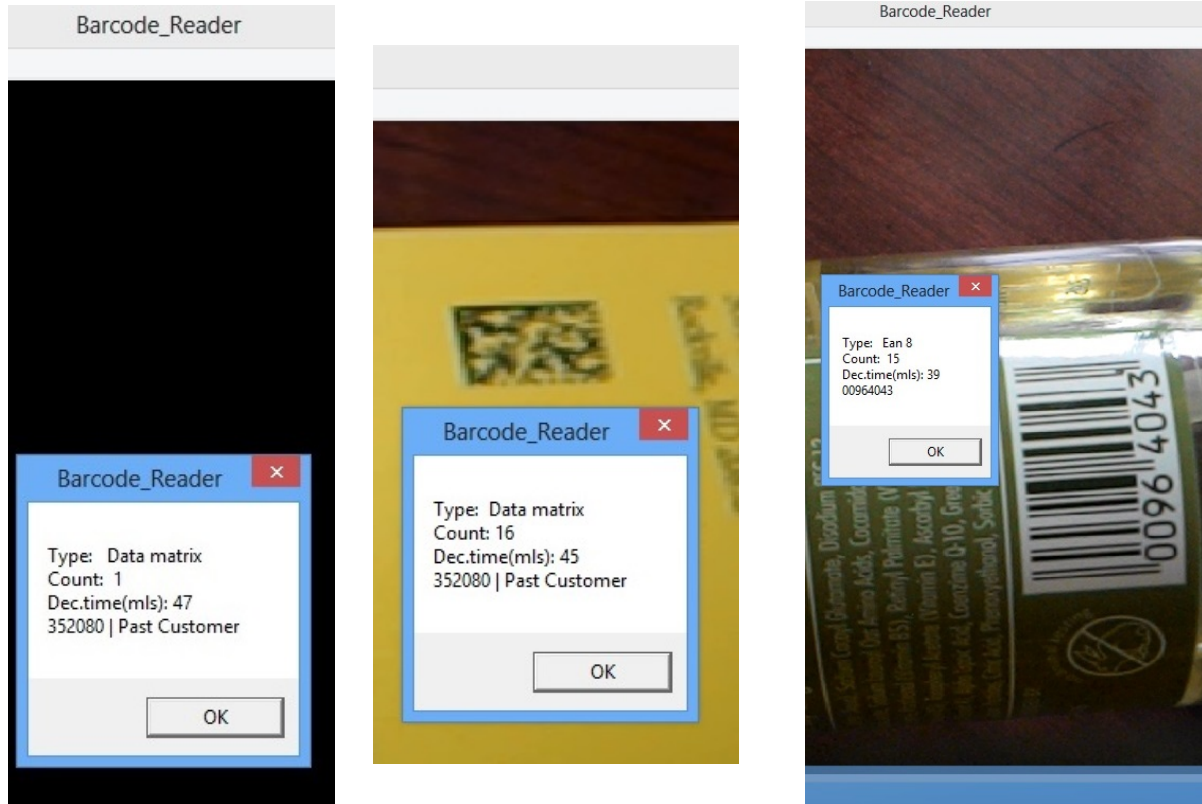
2DTG utilizes **Windows Media Capture 9 Series** tool for image capturing and camera manipulation.

Unlike regular 2D barcode scanner, which does not normally have auto-focus, tablet's camera may require slightly more time “to get acceptable image for decoding”, because of the certain auto focus response time that differs for different camera models. This time is translated into the number of “counts” – iteration cycles needed for capturing accepted image – shown in the “return” message box in our “Barcode Reader” application (see below). This number (“count”) may depend, of course, also on scanning distance and angle, barcode quality, illumination, surface condition.

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Other parameters in the Box:

- Symbology Type
- Average Decode time (msec)
- Decode Result



Note: if total decode time is short, Windows may not have enough time to “unfold” the barcode picture, returning a “black” screen with message box - left picture above (compare with the one in the middle - same sample intentionally placed out of focus at the beginning of scanning process).

RESOLUTION

One of the advantages of using camera in comparison with regular scanner is the ability to change camera resolution. Higher resolution is required for decoding higher density symbols (~ 5 mil cell size and less) and DPM (Direct Part Marking, including Dot Peen) samples, but it may result in longer decode time.

For most decoding needs VGA resolution (640x480) is enough – a good compromise between successes decode rate and decode time. Using the same ASUS VivoTab Smart Tablet PC as an

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example, 640x480 resolution is needed for 7.5 mil Data Matrix reading. For 5 mil reading 960x540 resolution is required.

Appendix 1 is to help to set up optimal resolution for Data Matrix.

4.5 DPM Reading Technique

Data Matrix component of the Barcode Decoder allows DPM (Direct Part Marking) including Dot Peen reading.

- Make sure that correct **Label Mode** setting is chosen - “**Reg +Dot (Dot Peen)**” – before decoding. This will allow reading both regular and DPM/Dot Peened matrixes.
- Since tablet PC camera is not furnished with aiming instrument it’s advisable to use **BD_Office.exe** (or **Barcode_Reader.exe**) allowing for Image Preview to assist in selecting the optimal reading distance and angle, which might be crucial for DPM marks. Hold the Device such that its “camera surface” is tilted to the mark surface (to prevent unwanted reflection). Depending upon the type of the mark and illumination the hade may vary within a ~ 15-45 degree range. Slightly change reading distance and angle as necessary to read the DPM mark while monitoring the Image Preview.
- Touch **Decoder** window if you decided to terminate this attempt. When image is decoded the device will stop reading automatically.
- Change settings – particularly “Camera Resolution” (Section 3 and 4.6) and/or “Filter” options (Section 3, 6), if you cannot decode symbol within 1-2 seconds.

Important!

If your tablet does not have 640x480 or higher resolution option, it’s not good enough for DPM reading.

- Consider camera resolution particularly when trying to decode Dot Peen sample. Higher resolution means better decode rate. However, the decode time would increase approximately in proportion with the matrix square, so the compromise shall be considered between the decodability and decode time, when necessary, though for tablet PC platforms this consideration is not as critical, as for mobile ones.

In addition, the “effective” resolution for DPM samples is affected by the lighting conditions, surface type, etc., so it is recommended to choose “one step higher” resolution for DPM samples than for the regular samples of the same size.

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Some DPM / Dot Peen samples decoded with 960x540 resolution setting (clockwise from left: 20 mil, 26 mil, 21 mil):



- Camera's Flash might be very useful for DPM decoding in some cases. However, **Windows Media Capture 9 Series** does not allow manipulating Flash. 2DTG can do this modification for particular Tablet PC per customer request.

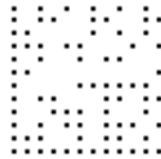
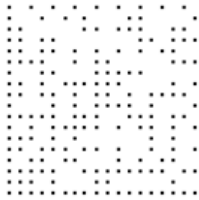
Important!

Try to avoid direct lighting or bright ambient light when scanning DPM (particularly Dot Peen) samples to prevent patches of reflected light within the image.

Verifying that DPM Decoder is enabled

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If, at any time, you need to make sure the DPM Decoder is enabled try to read Data Matrix Dot Peen symbols below. If you can decode these symbols – Decoder is installed and running correctly.



Operational Decoder:			Trial Decoder:		
2D Technology Group	Test1	Data Matrix xxx	2D Technol*****	Tes**	Data Mat*****

4.6 Pharmacode Reading

Pharmacode standard requires prior knowledge of the symbol reading direction, which normally can be easily understood from the “context”, where the symbol was printed. So, it is advisable to pay close attention to this thing when scanning the barcode, otherwise false reading may occur. Default setting for 2DTG’s Pharmacode library is “from Left to Right”.

4.7 Applying Pre-processing Filter

Data Matrix decoding library comes with optional pre-processing filters:

- **Sharpening filters** - Adaptive (Auto) Filter and SharpMask Filter recommended for low contrast and blurred images
- **“Print Correction Filter”** or **“BWR filter”** - designed to compensate for the printing conditions (“overprinting”) of some Data Matrix barcodes, having substantial irregularities in the printed module size and/or Grid Non-Uniformity (GNU).

ISO standard specifies required dimensions and tolerances in the final printed Data Matrix symbol. In real life, however, after the code is printed the dark cells may end up greater than the light ones due to a number of factors, but, most probably, due to the excessive ink spread in dark regions. If this “spreading” is too big (beyond the ISO standard), datamatrix decoding software may not be capable of “reading” the bar code (this image at right illustrates also the additional “printing” problem – the irregularities in the alternating pattern or even its “warping”).

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Similarly, the wear of the printing machine may result in displacement of the actual grid nodes towards their nominal positions in each cell of Data Matrix, causing it to become “unreadable”. Using “**BWR Filter**” allows to decode such codes, which are, otherwise, “not readable” (below left):

- **Combined Filter** – “**SM + BWR**” – designed to compensate both for the overprinting and fuzziness of some Data Matrix barcodes. Shall be used on barcodes with large values of “Print Growths” and having module size larger or about 5x5 pixels (above right).

All filters are applied to the captured image before decoding procedure if the corresponding option is chosen in the initial settings.

Important:

The caution shall be taken when applying the filters. If it is applied to the “regular” (reasonable quality) image it can, actually, make it undecodable. Only **Adaptive (Auto) filter** can be safely applied to any image – it does not degrade the symbol. That is why it is recommended always try the AUTO Filter decoding first and apply other filters only if it fails.

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4.8 Appendix 1

