COGNEX®

OCVMax Application Guide

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The OCVMax tool performs optical character verification (OCV), a process that verifies the characters in one or more character strings match the characters you expect in each aquired image. When you add an OCVMax tool to your vision application, you specify the number of strings you want to verify and the characters they should contain.

One of the challenges of character string verification is identifying valid character string candidates. Some strings display characteristics that an OCVMax tool handles easily, while other strings require an OCVMax tool be precisely configured to handle such issues as character rotation, rare fonts, and unusual object surfaces. Finally, some character strings resist an analysis by an OCVMax tool altogether.

For more information on how to use and configure an OCVMax tool, see the VisionPro .NET documentation, available by choosing **Start->Cognex->VisionPro->VisionPro .NET Documentation** on your PC.

OCVMax Image Guide

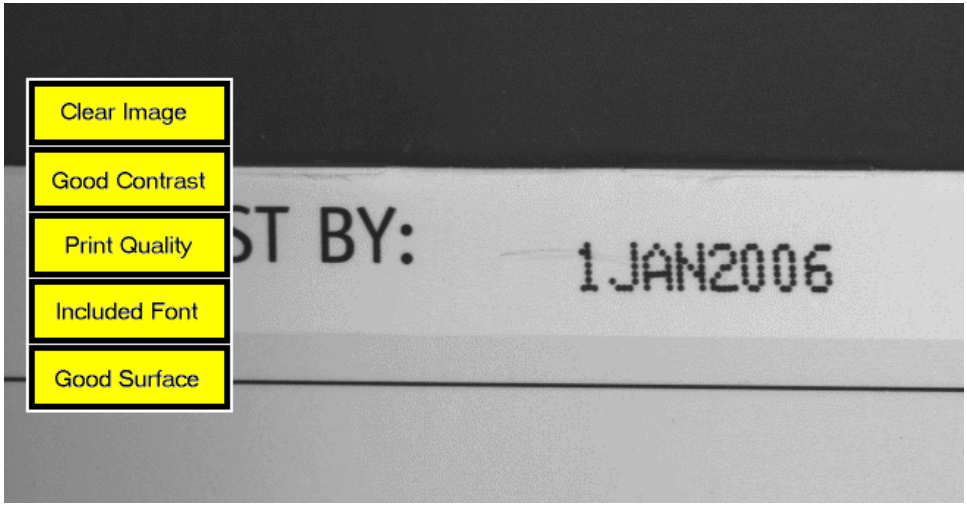
Particular qualities of the character strings in your acquired images determine the degree of success you will have using an OCVMax tool.

Good Character String Candidates

Character strings that can be successfully analyzed with an OCVMax tool typically share most of the following characteristics:

Characteristic	Description
Clear Image	The image contains sharp character edges.
Good Contrast	The image contains a minimum contrast level of 30 grey levels between the characters and the background.
Print Quality	The characters appear with no distortion.
Included Font	The characters in the string are composed of a font installed as part of the VisionPro product, located by default in the directory *C:\Program Files\Cognex\VisionPro\Fonts*.
Good Surface	The string appears on a clean flat surface with little or no qualities that could alter the desired appearance of a particular character.

The following image contains all the characteristics that make it a good candidate for analysis with an OCVMax tool:



The character string in the following image uses the font Arial Bold, which is not included with the software, but is available on most PCs in the *\WINDOWS\Fonts* directory.

Be aware that Microsoft Windows prevents you from directly opening font files in the *\WINDOWS\Fonts* directory. If you need to use a font from *\WINDOWS\Fonts*, first copy it to any other local directory.

Next, character strings that appear in a consistent location from image to image allow the OCVMax tool to locate the strings quickly, as shown in the following series of images:

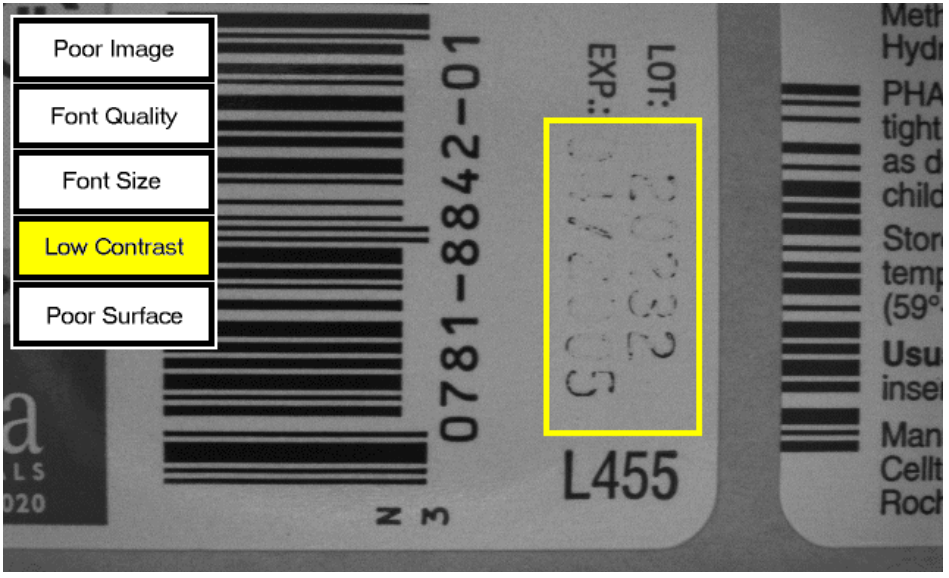
Poor Character String Candidates

Character strings that cannot be successfully analyzed with an OCVMax tool typically suffer from one or more of the following characteristics:

Characteristic	Description
Poor Image	The acquired image does not appear in focus or properly illuminated.
Font Quality	The characters appear distorted, either throughout the entire string or in relation to each other.
Font Size	Characters must have a minimum area of 20 x 15 pixels with a maximum area of 100 x 80 pixels.
Low Contrast	Images must have a minimum contrast of 30 grey levels between the characters and the background.
Poor Surface	Qualities of the surface where the string appears prevent the string from reliably appearing with sufficient quality.

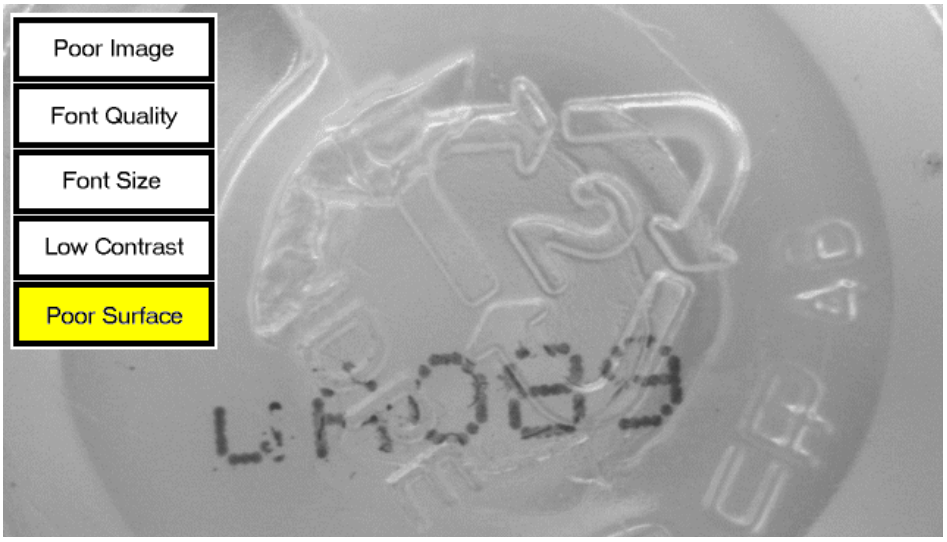
Insufficient Contrast

For example, the characters in the following image do not show enough contrast for an OCVMax tool:



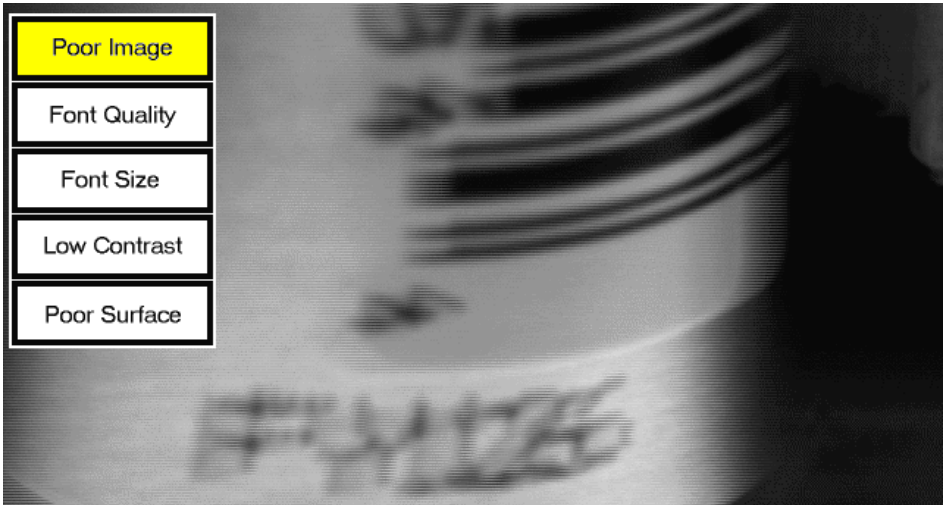
Unpredictable Surface Area

In the following image, the surface material underneath the character string rotates randomly during the print application, causing unpredictable character defects:



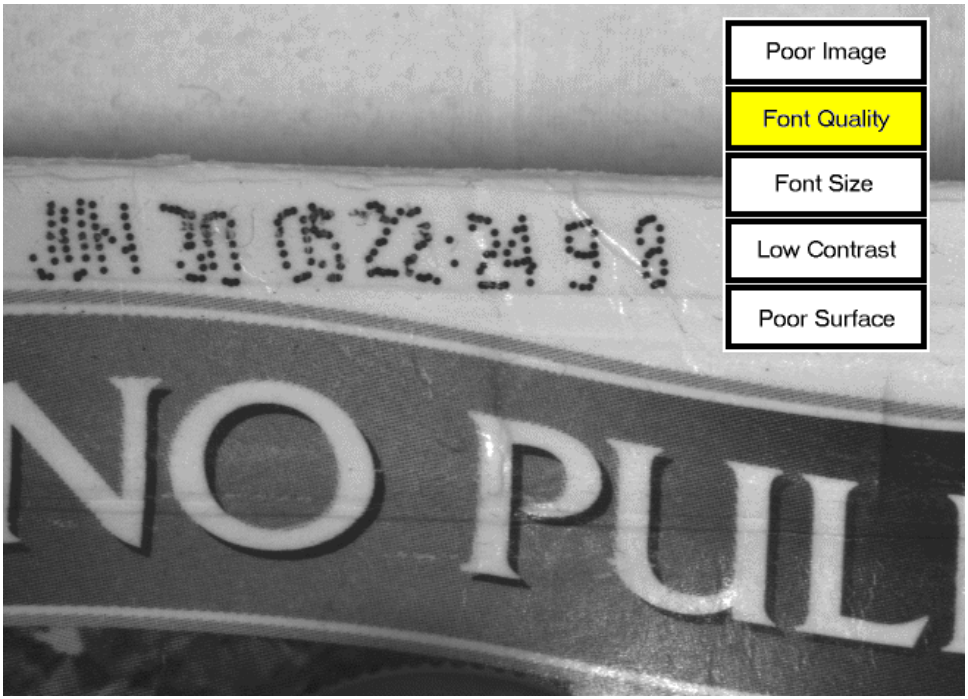
Poor Image Quality

The image acquisition settings must allow you to capture clear images of the character strings you want the OCVMax tool to analyze, as shown in the following figure:



Poor Font Quality

In the following figure, the characters are too distorted to be verified reliably:

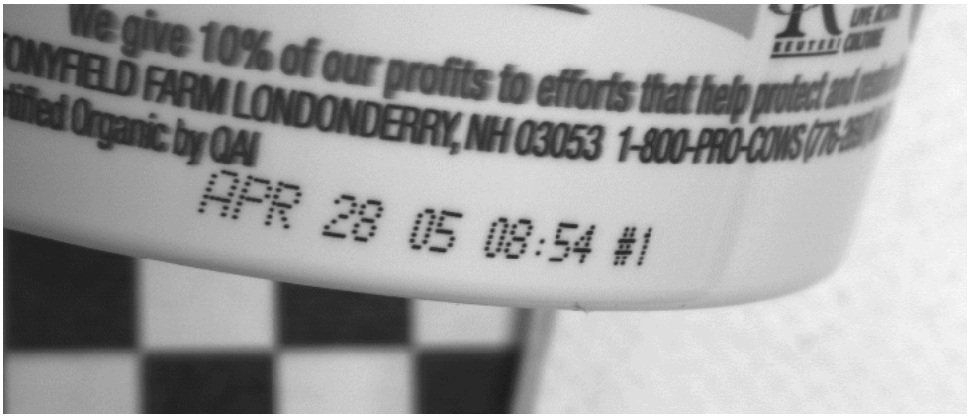


Possible Character String Candidates

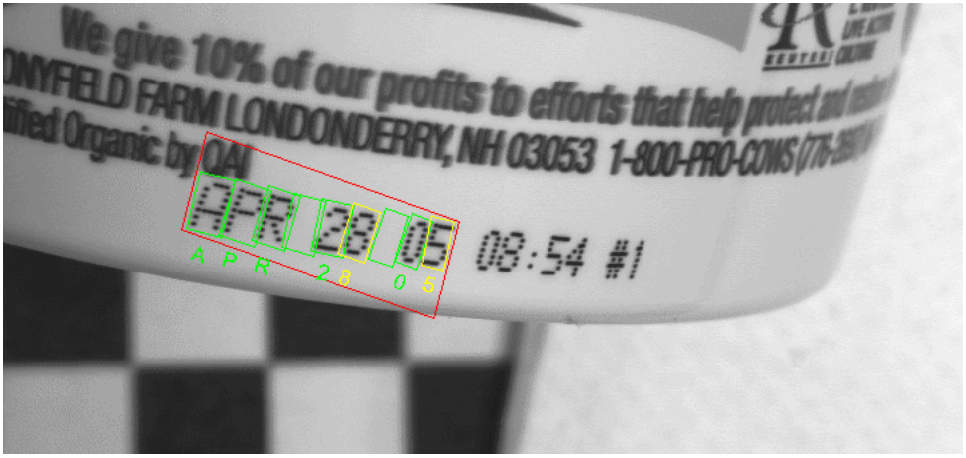
Using an OCVMax tool to analyze a character string with potentially difficult characteristics is possible with the right configuration parameters. The tool supports a tuning feature that allows it to generate a good set of search parameters, both for locating the character string as a whole, and for identifying individual characters in the string.

Verifying Character Strings on a Curved Surface

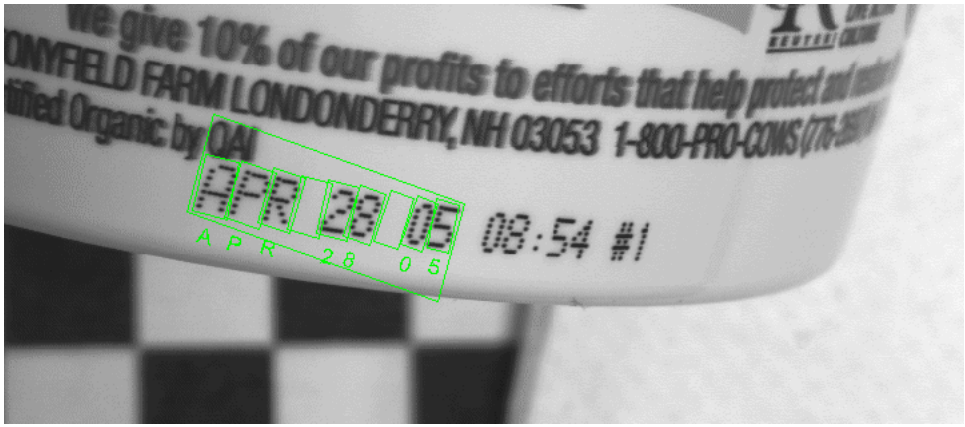
The following image shows a character string printed on a curved surface:



Even after tuning, an OCVMax tool can still fail to verify a couple of characters in the string:



By raising the confusion threshold and lowering the accept threshold for individual character parameters, the OCVMax tool reliably locates and verifies the character string as shown:



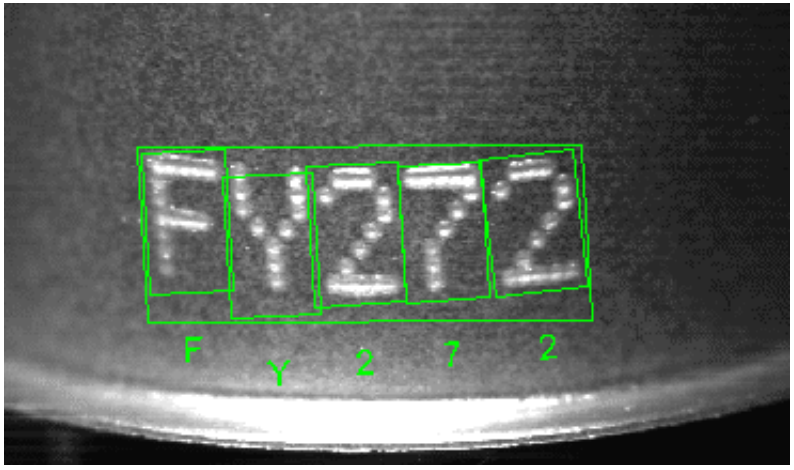
See the VisionPro .NET documentation for the OCVMax tool for a description of confusion threshold and accept thresholds.

Using Advanced Tuning Parameters

The following figure contains a character string that uses a 5 x 7 dot-matrix font, but the string appears as light characters against a dark background, which is not the default polarity setting:

In addition, the characters appear with a high degree of vertical shift with respect to each other. In such an image, the tuning feature an OCVMax tool supports might fail to generate a good set of search parameters because the default ranges for various degrees of freedom are set too low. By choosing the correct polarity setting and opening the range for

advanced tuning parameters such as Y Shift, the tuning feature can complete successfully and the OCVMax tool will locate and verify each character without additional configuration, as shown in following figure:



See the OCVMax tool documentation for a description of the tuning feature and how to enable advanced tuning parameters.

Opening Font Render Parameters

The following figure shows a training image where the numerical string appears with a wider spacing than the tuning feature would normally expect:

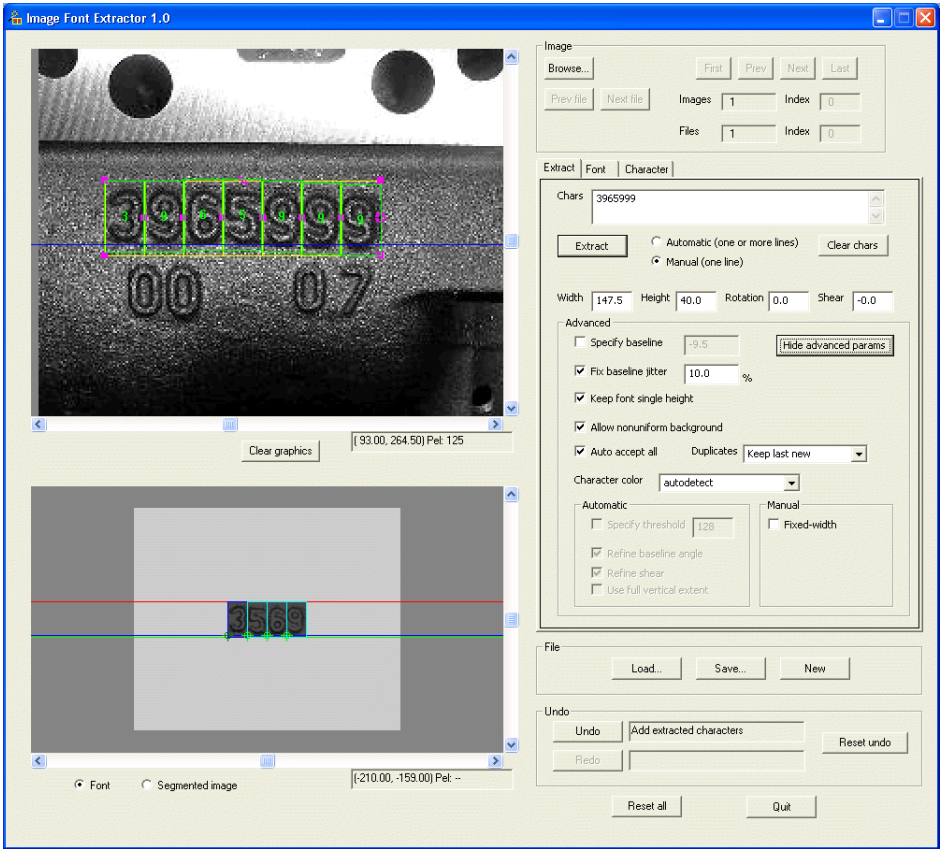
When you create an example of the character string you want to verify, you place the graphics for the string over the training image. During this time, the OCVMax tool allows you to specify additional font rendering parameters. By increasing the horizontal character spacing parameter, the tuning feature can locate the widely spaced characters in the string, as shown in the following figure:

Creating a Font File

The following image contains a character string where the surface material can cause a great deal of degradation on a character by character basis:

For images with custom fonts or where the surface can alter the appearance of the font in a predictable way, VisionPro includes an Image Font Extractor for you to generate your own font file from any image.

Launch the Image Font Extractor by choosing **Start->Cognex->VisionPro-> Utilities->Image Font Extractor** on your PC. The following image shows the Image Font Extractor in the processing of creating a font file from the previous image:



Using a generated font, an OCVMax tool can reliably verify the characters in the original image as shown:

Getting the Right Font

To successfully verify a character string, you must have the correct font file. If you do not have the appropriate font file for the characters that appear in your string(s), Cognex recommends the following options:

- Contact your print vendor for the font file.
- Try the web site www.myfonts.com/WhatTheFont/, which is an online source for finding, trying, and buying fonts. The site boasts 41,680 fonts with search tools that allow you to find the font you use.
- Consider generating your own font file using the Image Font Extractor, described in the previous section.
- Contact your Cognex sales representative.

Included Font Files

An OCVMax tool requires you load a specific font file for the type of characters in the strings you want to verify. After you load a font file, you can configure an OCVMax tool to exclude the characters in the font that cannot appear in the strings you want to verify. For example, you can exclude lower-case letters or specific punctuation marks. Excluding the characters that cannot appear in your acquired images improves the performance of the OCVMax tool.

VisionPro automatically includes the following font files:

Font Name	Font File
Xymark: Simplex	Simplex.vf
Xymark: Simplex - A	SimplexA.vf
Xymark: Simplex Roman	SimplexRoman.vb
Domino: 1LS-Arial-Fast	1LS-Arial-fast.cst
Domino: 1LS-Arial-Kap	1LS-Arial-Kap.cst
Domino: 1LS-Arial	1LS-Arial.cst
Domino: 1LS-OCR-A	1LS-OCR-A.cst
Domino: 1LS-OCR-B-10BT	1ls_ocr_b_10bt.cst
Domino: 1LS-Rom	1LS-Rom.cst
Videojet: 10 x 16	FNT10x16.XCL
Videojet: 5 x 7	US5A7V7.XCL
Videojet: 5 x 7	us5a7v7_alt3.xcl
Videojet: 7 x 9	US7A9V7.XCL
Videojet: 10 x 16	US1016V7.XCL
Markem: 5 x 5	char_5_5.ffn
Markem: 10 x 16	hi_res16.ffn
Markem: 5 x 7	hi_res7.ffm

In addition, the OCVMax tool can use any font file that uses the same format as the font files listed in the previous table. For example, VisionPro can use any Xymark font file with a .vf extension, or any Markem font file with a .ffm extension.

The VisionPro installation utility automatically installs these font files when you install VisionPro. By default, the installation utility installs them in the directory *C:\Program Files\Cognex\VisionPro\Fonts*.

Examine the following sections to see if the font you use is already installed as part of the VisionPro software.

Domino: 1LS-OCR-B-10 / 1ls_ocr_b_10bt.cst

Domino: 1LS-Arial / 1LS-Arial.cst

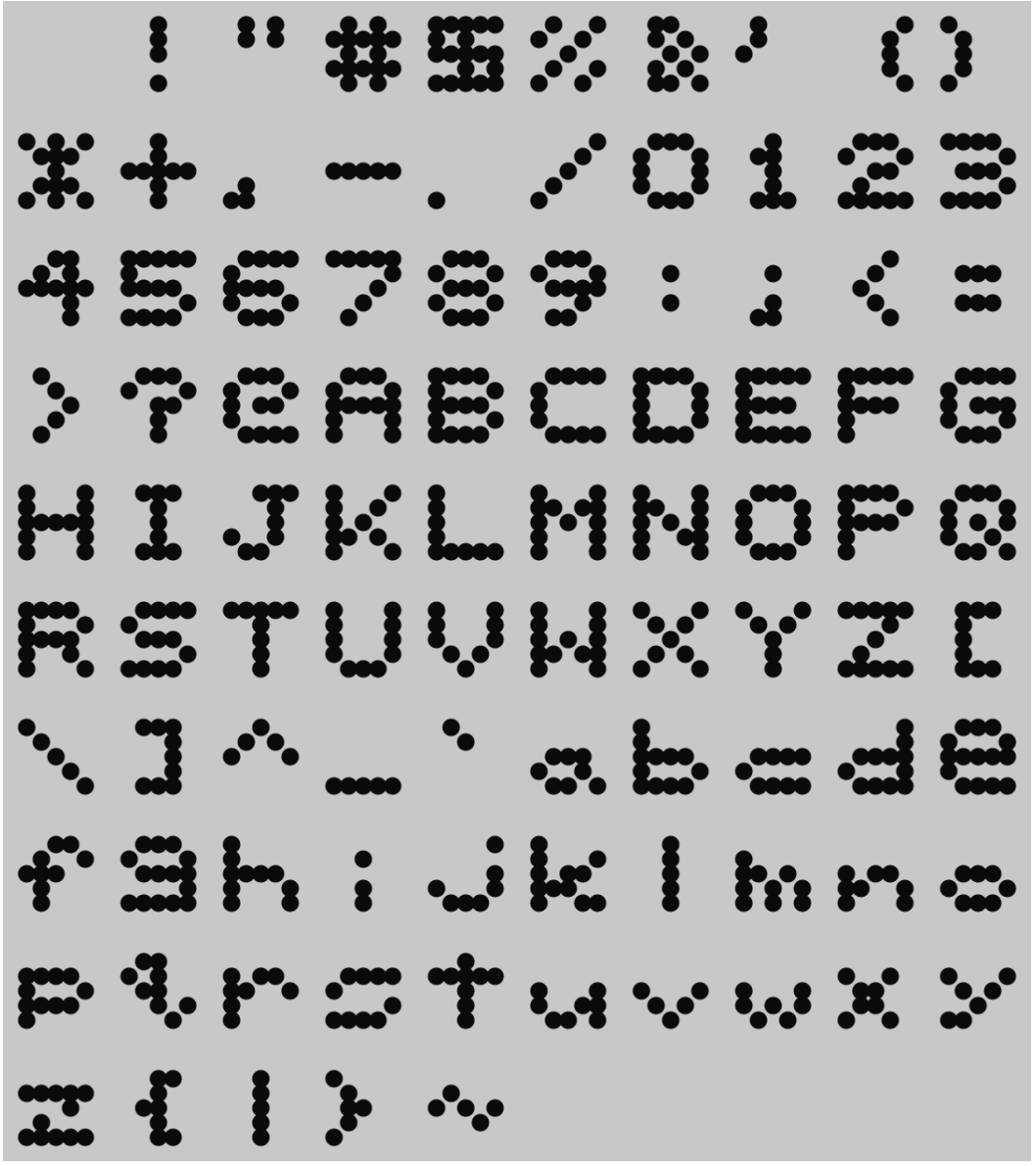
Domino: 1LS-Arial-Fast / 1LS-Arial-fast.cst

Domino: 1LS-Arial-Kap / 1LS-Arial-Kap.cst

Domino: 1LS-OCR-A / 1LS-OCR-A.cst

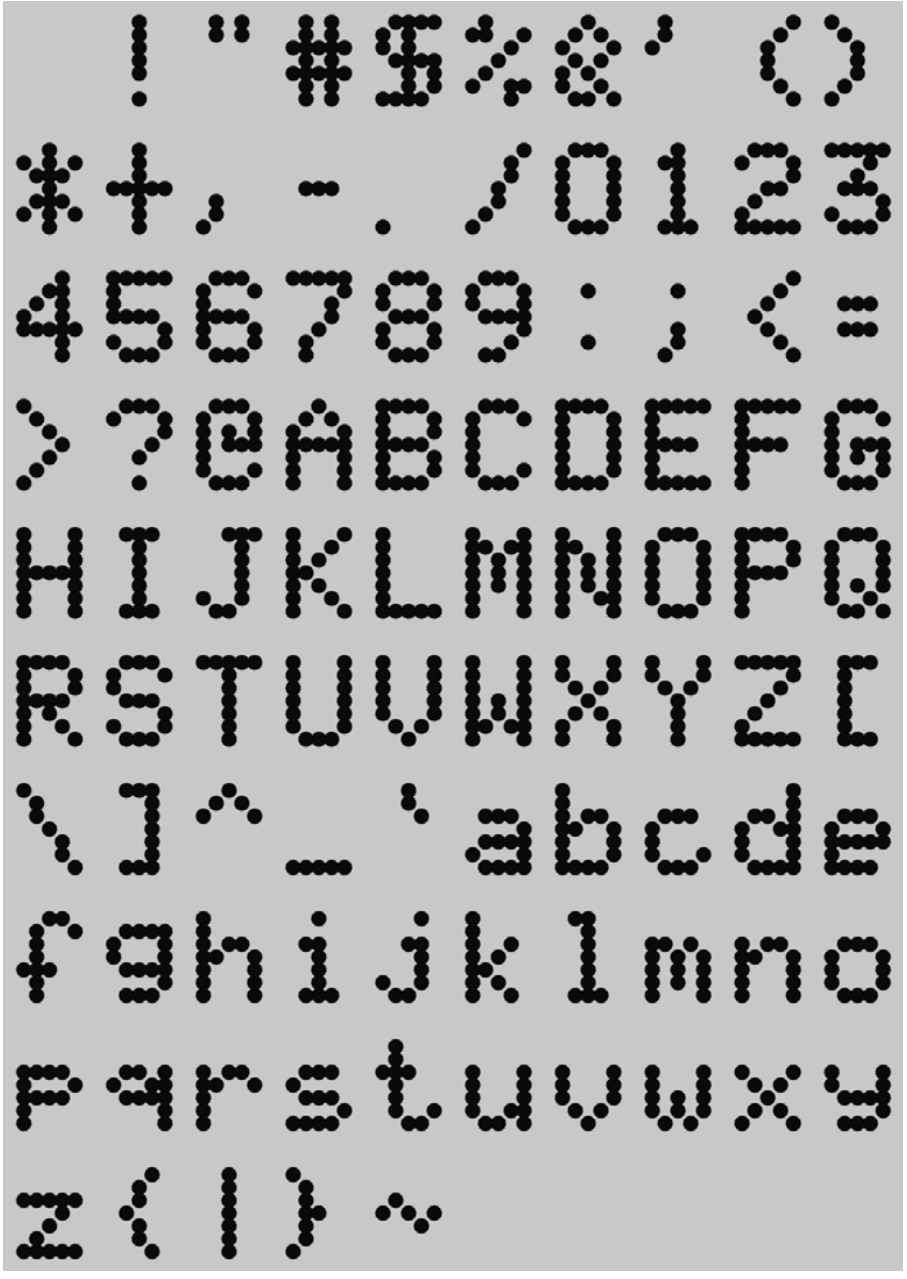
Domino: 1LS-Rom / 1LS-Rom.cst .

Markem: 5 x 5 / char_5_5.ffn



Videojet: 10 x 16 / FNT10X16.XCL

Markem: 5 x 7 / hi_res7.ffn



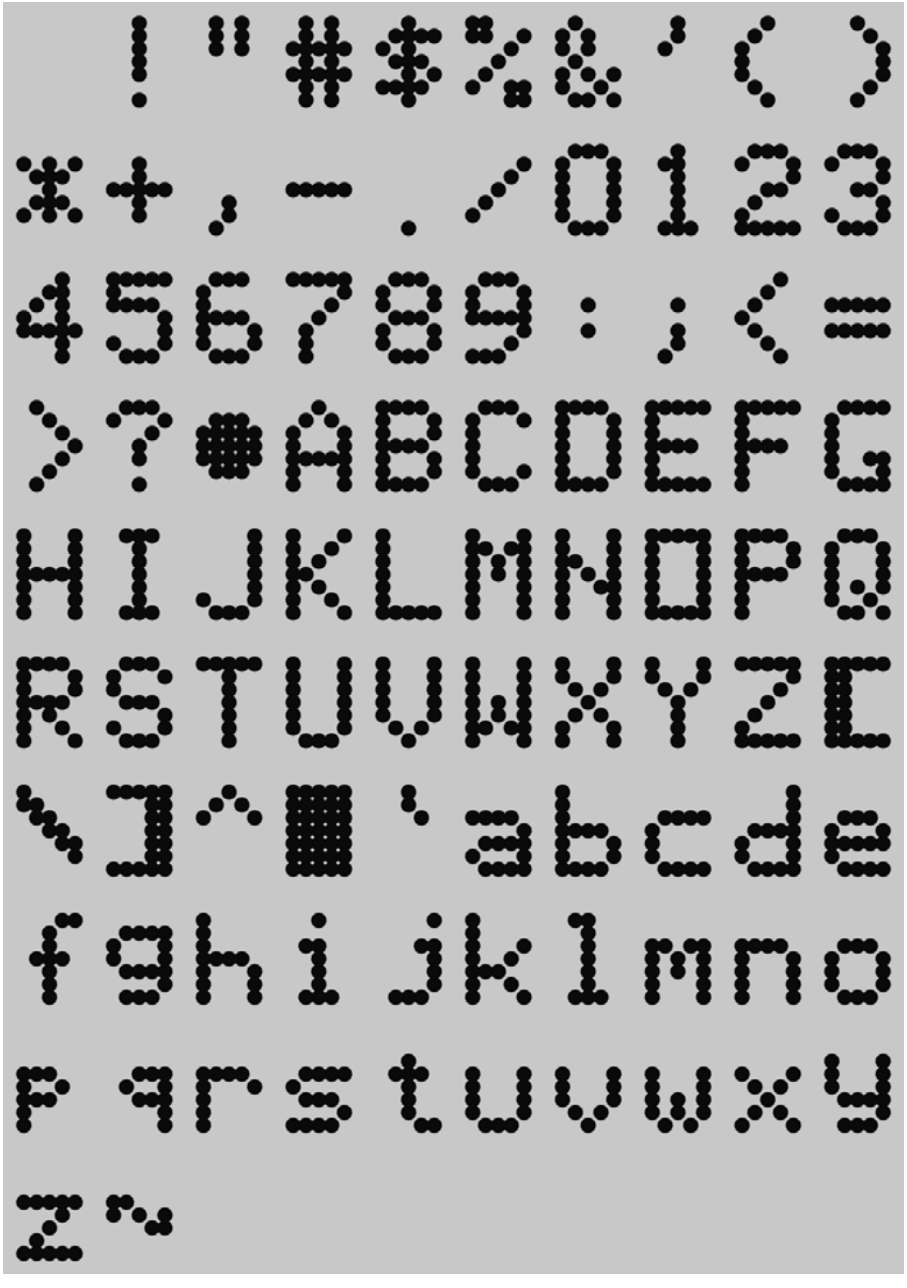
Markem: 10 x 16 / hi_res16.ffn

Xymark: Simplex / Simplex.vf

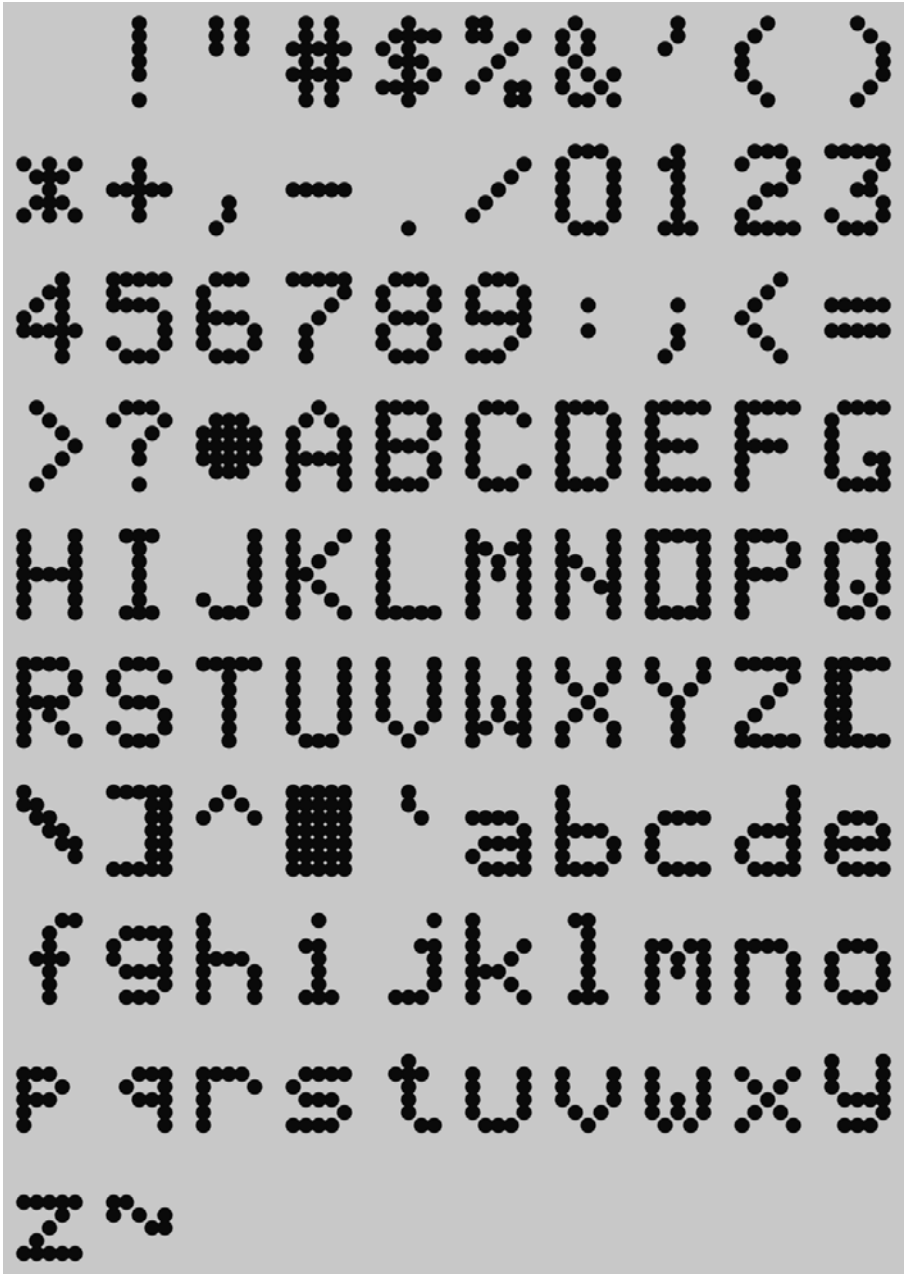
Xymark: Simplex - A / SimplexA.vf

Xymark: Simplex Roman / SimplexRoman.vf

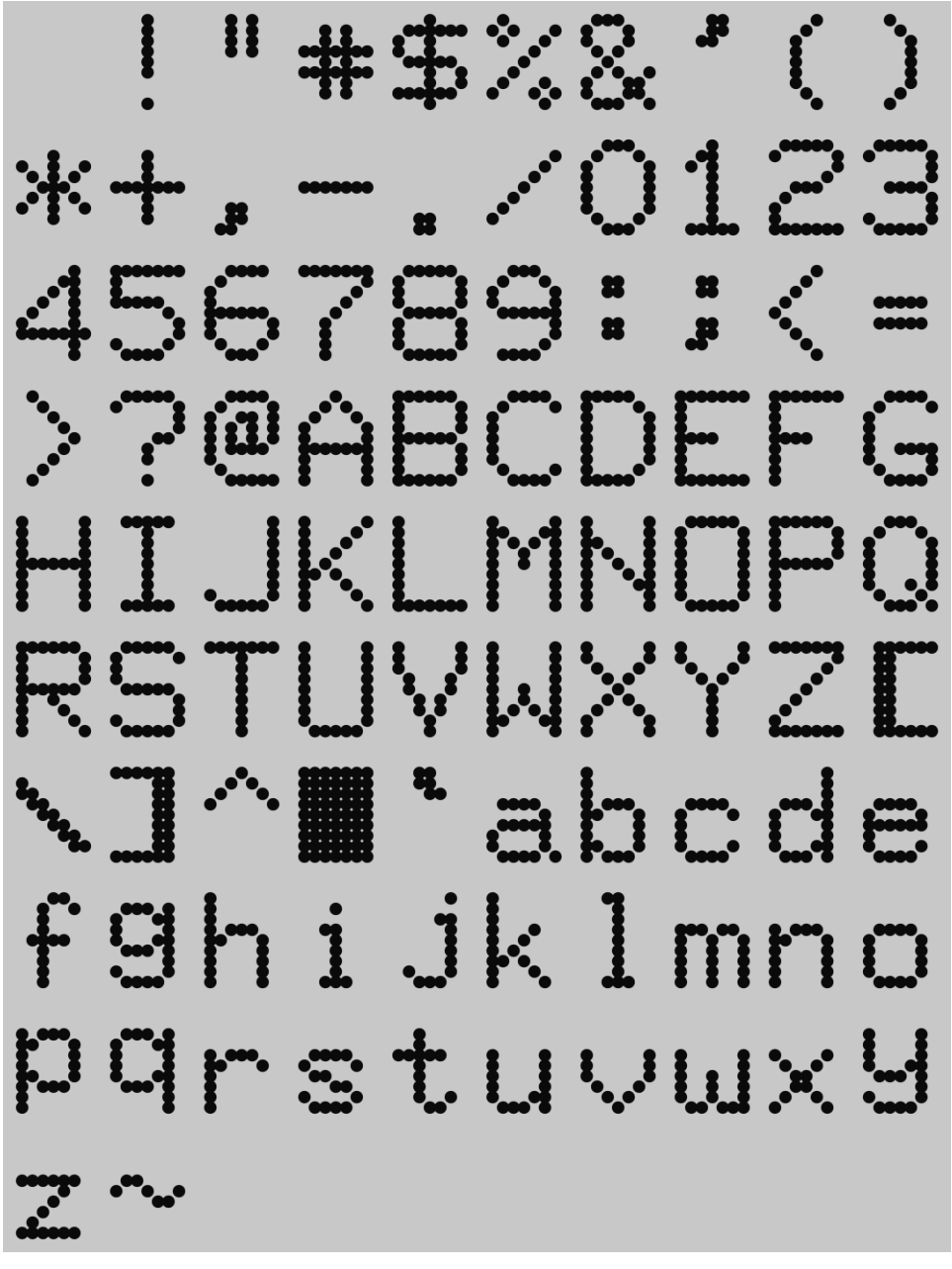
Videojet: 5 x 7 / US5A7V7.XCL



Videojet: 5 x 7 / us5a7v7_alt3.xcl



Videojet: 7 x 9 / US7A9V7.XCL



Videojet: 10 x 16 / US1016V7.XCL