

Introduction

The Pixblasters MS1 Video LED Controller drives LED display matrices arranged in non-segmented and zig-zag segmented arrangements. Properly initialized Pixblasters LED controller handles any of those LED matrix arrangements fully automatically and with no need for any input image manipulation.

The display matrix must be correctly described through the initialization explained in the following application note:

http://pixblasters.com/wp-content/uploads/2021/02/papp002-Pixblasters-Quick-Start-Guide_v1.0.pdf

While the PAPP002 application note explains the initialization process in general, this application note explains details related to the display matrix description.

Initialization details will be explained on the LED matrix example presented in this short video clip: https://youtu.be/o_5djzdhzHY.

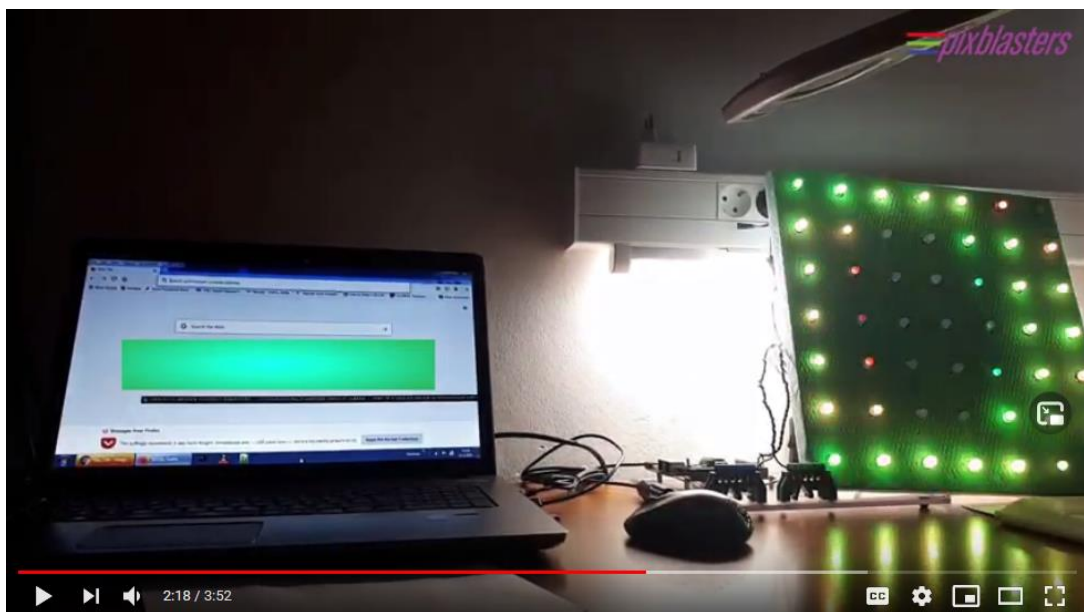


Figure 1. The Fastest Possible WS2811 Video LED Display - Click on Photo to Play Video

LED Strip Matrix Arrangements

Figure 2 shows the LED strips arrangement without the strip segmentation. All of 32 Pixblasters MS1 controller's outputs drive a display line of maximally 512 LED pixels. In this arrangement, the maximum vertical resolution supported by a single Pixblasters MS1 LED controller is 32 lines.

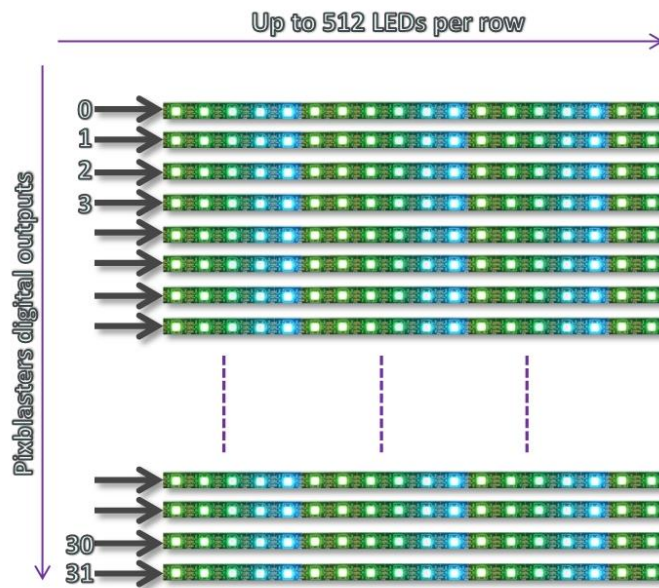


Figure 2. Non-Segmented LED Strips Matrix

Figure 3 shows the LED strips arrangement with the line segmentation, which enables more flexibility in display's resolution setup. Each Pixblasters MS1 controller's digital output can drive max. 512 pixels, but those pixels can be arranged in multiple display lines. Figure 3 example matrix has 4 lines driven by a single Pixblasters digital output and this arrangement enables the maximum resolution 128 x 128 (Horizontal x Vertical) pixels.

The LED matrix with the embedded segmentation requires a bit different LED strips wiring and it is absolutely necessary to take care on the data flow direction. Take for example the four horizontal lines controlled by the digital output 0 from the Figure 3. The first LED strip segment must have the DIN data arrow (Figure 4) pointing from left to right, the second LED segment must have the data arrow pointing from right to left, the third one from left to right, and the fourth from right to left. Such LED arrangements assures an uninterrupted serial data flow.

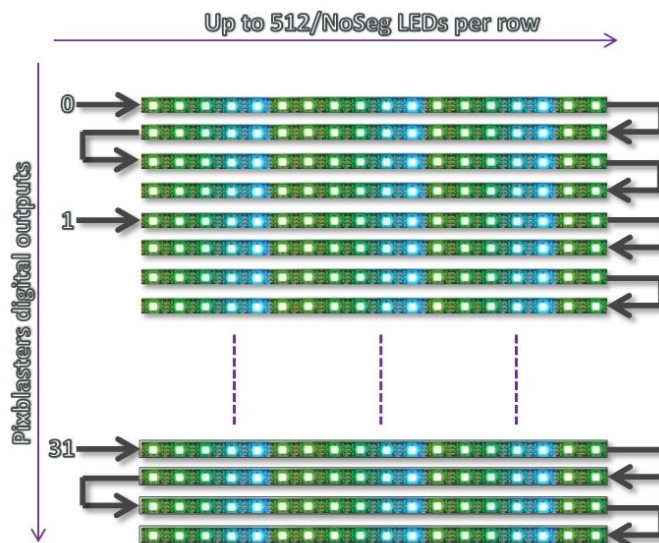


Figure 3. Segmented Zig-Zag LED Strips Matrix

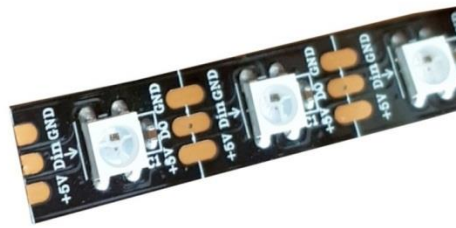


Figure 4. LED Strip's Data Interface

7x7 Segmented LED Matrix Example

The video clip from the Figure 1 shows a miniature 7x7 LED matrix in the zig-zag LED arrangement. Figure 5 explains the display's architecture.

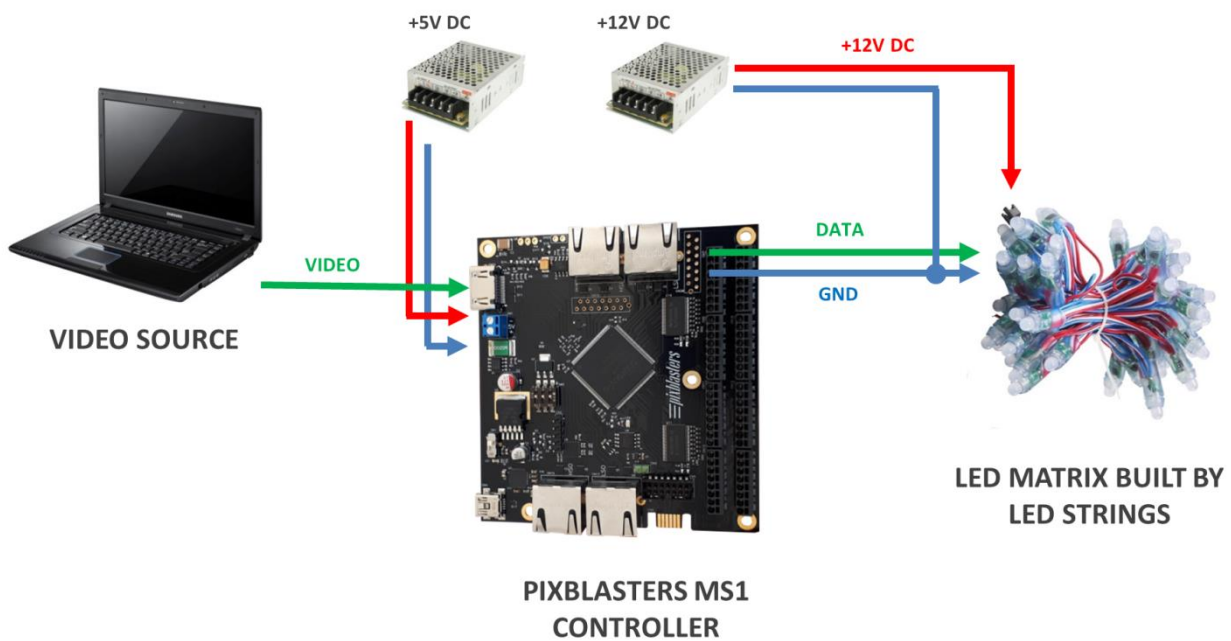


Figure 5. WS2811 Video LED Display Architecture

All 49 demo display's LEDs are serially connected to a single Pixblasters MS1 LED controller's output. The WS2811 LEDs commonly use +12 VDC for the power supply and +5 VDC for control data, and the display system needs two power supplies. The Pixblasters controller needs only +5 VDC for its operation. The PC video display output can be used as a video signal source.

Figure 6 shows the back side of the demo LED display matrix. Prior to the LED matrix setup, it is absolutely necessary to properly recognize the first LED in the serial string.



To find out the beginning of the LED string, please find the LED with the DIN input connected to the open-end wire or the input (black) connector. The last LED's DIN input is wire-connected to the predecessor LED's DOUT output and not to the end connector.

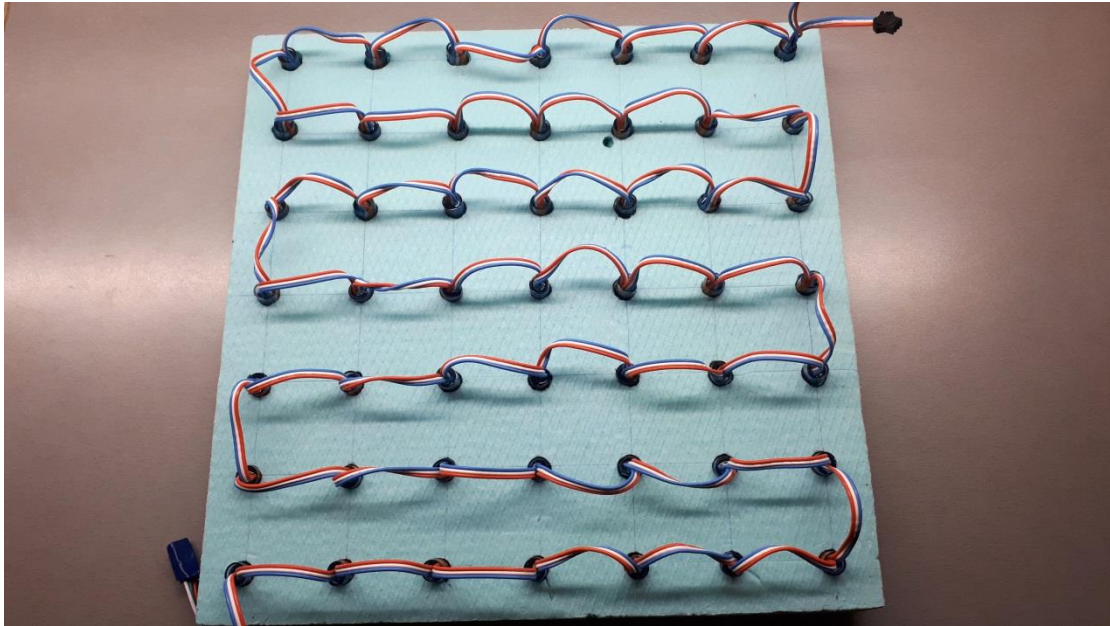


Figure 6. WS2811 Segmented LED Matrix

The Pixblasters MS1 Video LED controller displays the selected portion (cropping window) of the input video image on the attached LED matrix. The cropping window position and sizing are programmable through the following registers: CROPX, CROPY, STOREX and STOREY. The following figure explains how to define the video cropping window.

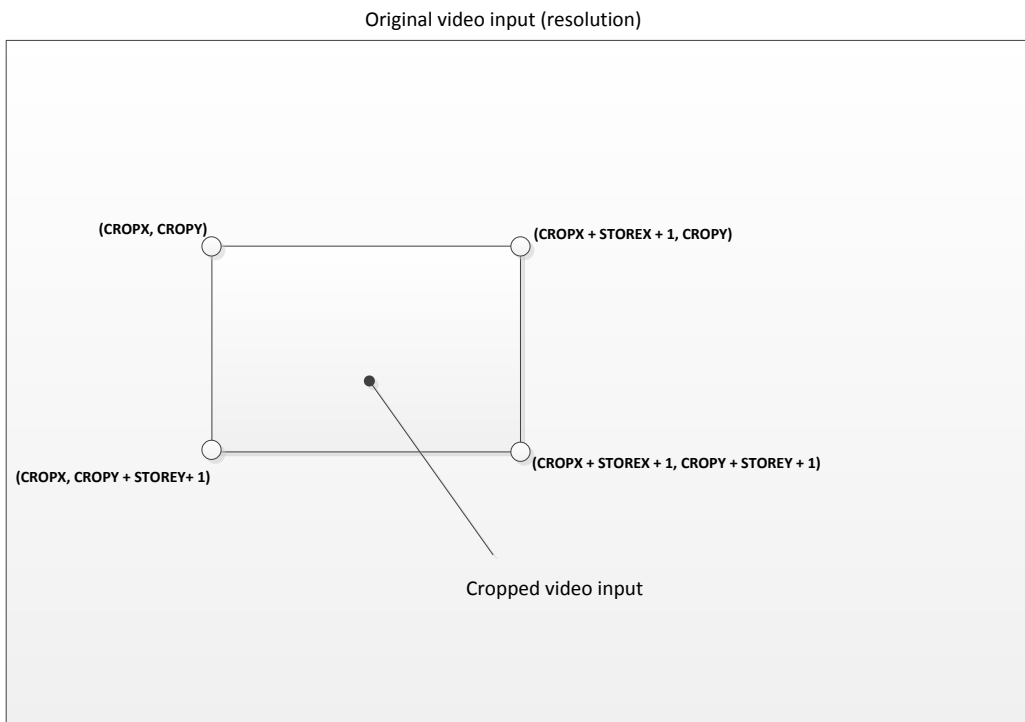


Figure 7. Definition of the Cropping Window

Table 1 shows the initialization setup for the non-segmented LED display matrix. Please consult the Pixblasters User's Manual regarding technical details:

http://pixblasters.com/wp-content/uploads/2020/03/Pixblasters-MS1-Users-Guide_v1.0.pdf

Register Name	Value	Description
CONTROL	0x0001	Enables the Pixblasters controller
CROPX	600	Defines the top left pixel of the cropping window – pixel position (600, 500)
CROPY	500	
STOREX	48	Defines the width and the height of the cropping window. The width of the window defined to 49 pixels and its height to 7 pixel lines.
STOREY	6	
STOREHRES	49	Defines the length of the LED line
STOREPRESCAL	0x00	Must be 0 for WS2811
PROGLUTS	0x00	Not applicable (N.A.)
SEGMENTSNO	1	Number of LED segments in the Zig-Zag line. Here it is only 1 segment – non-segmented line.
CFGLOADCTRL	0x00	N.A.
AUX1, AUX2	Reserved	N.A.

Table 1. Non-Segmented Display Setup

Initialization parameters from the Table 1 would produce distorted image displayed on our demo display from the Figure 6. All 7 lines of LEDs would behave as a single LED display's line.

Table 2 shows the proper initialization setup for the zig-zag segmented LED display matrix (Figure 6).

Register Name	Value	Description
CONTROL	0x0001	Enables the Pixblasters controller
CROPX	600	Defines the top left pixel of the cropping window – pixel position (600, 500)
CROPY	500	
STOREX	6	Defines the width and the height of the cropping window. The width of the window defined to 7 pixels and its height to 7 pixel lines.
STOREY	6	
STOREHRES	49	Defines the length of the LED line to 49 pixels (7 lines of 7 pixels). It is a sum of all LEDs from all pixel lines connected to a single controller output.
STOREPRESCAL	0x00	Must be 0 for WS2811
PROGLUTS	0x00	Not applicable (N.A.)
SEGMENTSNO	7	Number of LED segments in the Zig-Zag line. Here it is 7 segments, i.e. 7 pixel lines.
CFGLOADCTRL	0x00	N.A.
AUX1, AUX2	Reserved	N.A.

Table 2. Segmented (Zig-Zag) Display Setup

120x120 Segmented LED Matrix Example

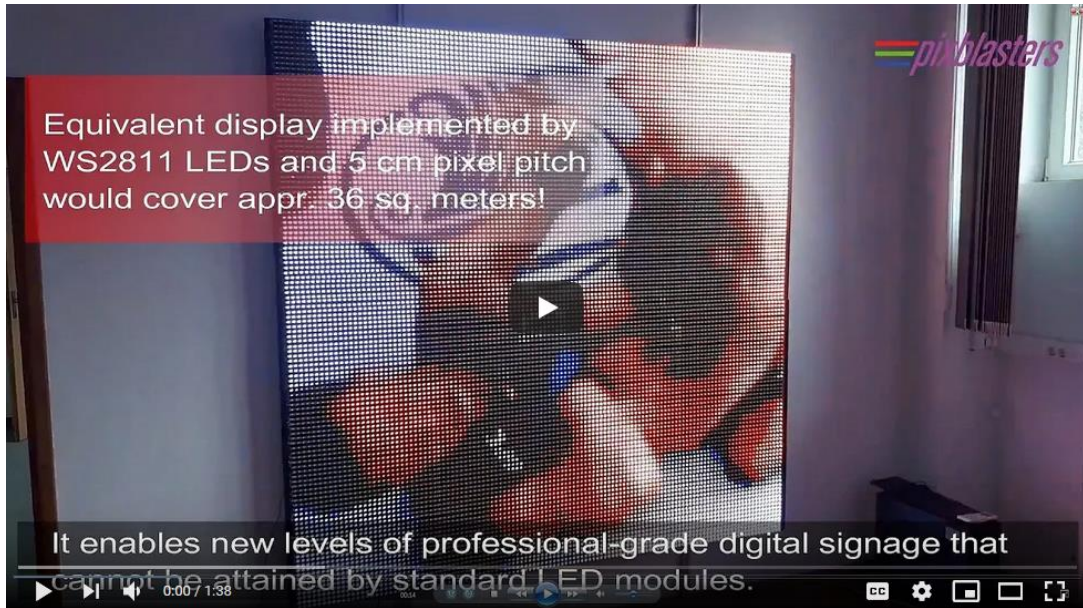


Figure 8. 120x120 Video LED Display in Action – Click Photo to Play Video

This chapter explains the initialization of the much bigger video LED display (<https://youtu.be/Yd34FQWuG3s>). The main display parameters are:

- WS2812B 60 LEDs/m strips; 120x120 (H x V) total resolution
- Built by two detachable parts (Figure 9); each with the resolution 60x120
- Zig-zag LED matrix with four (4) display lines driven by a single Pixblasters LED output
- Used only 15 digital outputs of each Pixblasters controller (15 x 4 lines = 60 lines) because the separable halves were required
- The upper half display controlled by the Pixblasters MS1 set in the Master mode (HDMI video input active). On-board DIP switches must be set to 001
- The lower half display controlled by the Pixblasters MS1 set in the Slave mode (Ethernet HIS video input). On-board DIP switches must be set to 010



Figure 9. Segmented (Zig-Zag) Display Setup During the Build-Up

Table 3 shows the proper initialization setup for zig-zag LED display matrices (Figure 8).

Register Name	Master Setup	Slave Setup	Description
CONTROL	0x0140	0x0140	Enables the Pixblasters controller. Due to the LED type, changed order of RGB color components.
CROPX	600	600	Defines the top left pixel of the cropping window – pixel position (600, 500) for the master display. Slave display cuts the input image below master's cropping window, at the (600, 560) position.
CROPY	500	560	
STOREX	119	119	120 pixels per line
STOREY	59	59	60 lines in total / per display
STOREHRES	480	480	Each digital output drives 4 lines of 120 LEDs => 4 x 120 = 480
STOREPRESCAL	0x00	0x00	Must be 0 for WS2812B
PROGLUTS	0x00	0x00	Not applicable (N.A.)
SEGMENTSNO	4	4	Number of LED segments in the Zig-Zag line is 4.
CFGLOADCTRL	0x00	0x00	N.A.
AUX1, AUX2	Reserved	Reserved	N.A.

Table 3. Initialization Parameters for 120x120 Video LED Wall

Recommendations and Conclusion

The zig-zag LED matrix organization enables the Pixblasters LED controller to support flexible video LED display resolutions. The whole process is automatically handled by the Pixblasters controller and there is no need for any video image preprocessing. Simply, the Pixblasters MS1 Video LED Controller plays a perfect video image on the attached LED matrix; whether in the zig-zag or non-segmented arrangement.

To find detailed description of the Pixblasters MS1 operation, please check the User's Manual and Pixblasters application notes: <http://pixblasters.com/documents/>

For more instructions video clips, please visit: <http://pixblasters.com/videos/>

Revision History

Version	Date	Description of Revisions
1.00	15.03.2021.	Initial public release.