

Introduction

Before the first use, or in a case of a significant change of the LED display controlled by already initialized Pixblasters™ LED controller, the MS1 Video LED controller must be initialized through the embedded user's interface. Uninitialized LED controllers cannot display any video.

The Pixblasters MS1 Video LED Controller controls very diverse LED display configurations and its control electronics must be programmed with the exact display's resolution, display's architecture (non-segmented, segmented, clock speed), and with the exact part of the input video for the LED display. Additionally, by means of on-board DIP switches, the MS1 Video LED Controller must be configured for either master or slave operation modes

The complete initialization process for use with WS2812B LEDs is described in this short video clip: <https://youtu.be/6BcOaJHcRD8>.

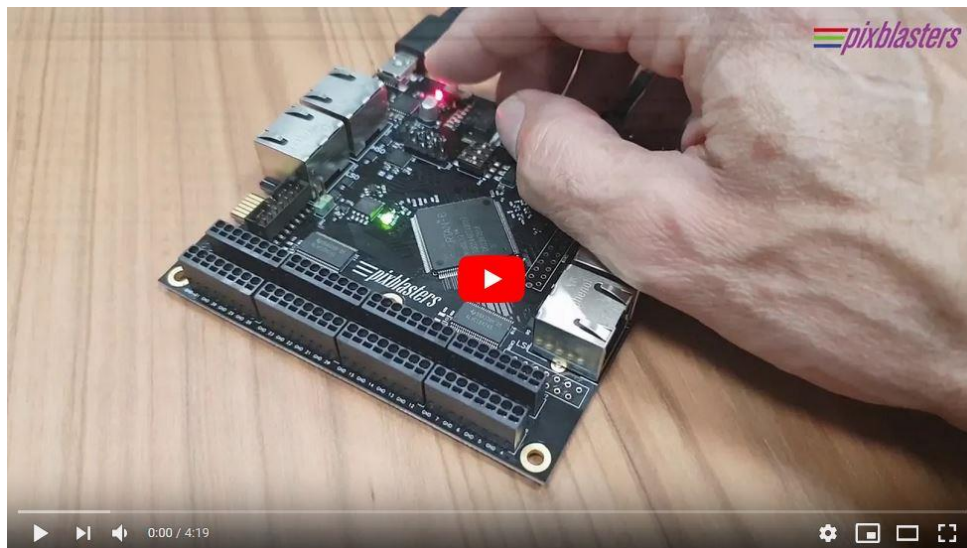


Figure 1. Quick Start Guide - Click on Photo to Play Video



Please use the FPGA configuration 001 (set up DIP switches) instead of 011 showcased in the Quick Start Guide.

The initialization is very simple and can be done within a couple of minutes. It is also permanent, since the initialization parameters stay permanently stored in on-board memory. In case that the LED video display's architecture, such as the number of lines (pixels rows) does not change during its lifetime, the Pixblasters MS1 Video LED Controller's initialization must be executed only once!

The software initialization runs on any control computer and any operating system that enables use of a simple serial terminal emulation program. The Pixblasters development team preference is the Tera Term, an open-source and free terminal emulator program: <https://tssh2.osdn.jp/>. The expected serial communication parameters are: baud rate 115,200, data 8 bit, no parity, 1 stop bit and no flow control.

Required hardware equipment is also very simple and includes only the control computer, Mini-B USB serial cable and the +5 VDC power supply. Upon the initialization, the control computer and the USB serial cable can be permanently disconnected.

Pixblasters MS1 Controller - Important Terminals

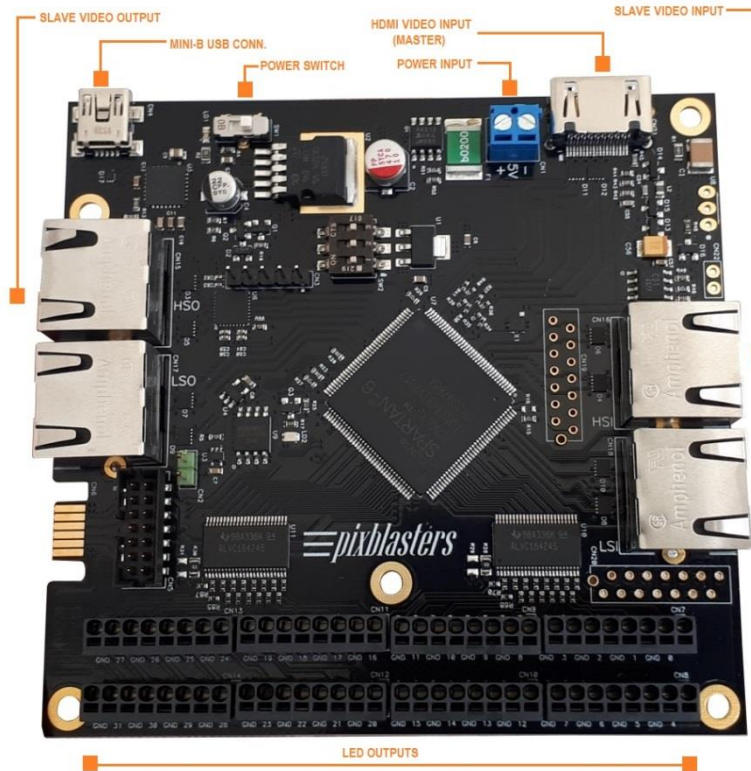


Figure 2. Board's Terminals Important for the Initialization Process

- +5 VDC power supply connects to the blue power input screw wire terminal
- Power switch – the red LED next to the switch is ON when the board is powered
- Mini-B USB connector for serial connection with the control computer
- HDMI video input is the active video input in the Pixblasters MS1 Master configuration
- Slave video input (RJ45 type connector) is the active video input in the Pixblasters MS1 Slave configuration
- Slave video output (RJ45 type connector) is the active video output in both, the Master and the Slave configurations
- 32 LED outputs are placed on eight snap-in connectors (black)

Display's Content Definition

The Pixblasters MS1 Video LED Controller receives the video formatted for the monitor, crops the image part selected for the LED display, as shown in the next figure, and drives the LED strips by properly formatted video data.

The complexity of LED driving is hidden from the driving computer and the LEDs display any content enclosed by the area selected from the monitor image.

The Figure 3 shows the general use case and explains how the Pixblasters MS1 Controller selects for LED display the part of the input video image. Registers CROPX and CROPY defines the top left corner of the input video selected portion, STOREX defines its width and the STOREY its height.

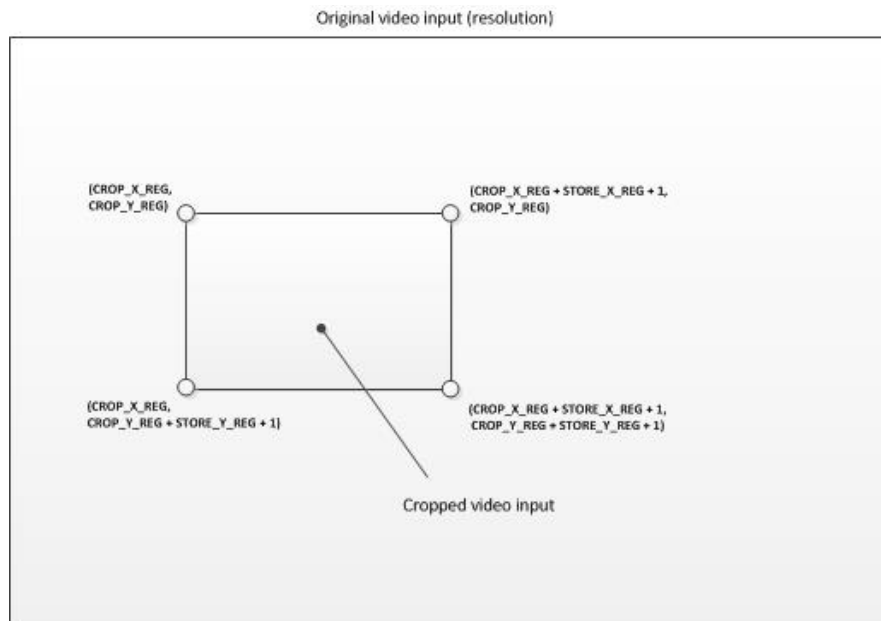


Figure 3. Explanation of Video Input Cropping

This document and the assigned video clip show the setup for an example LED display with the horizontal resolution of 100 pixels and the vertical resolution of 16 pixels. Each horizontal line is connected to the dedicated LED output of the controller, i.e. there is no line segmentation described in the User’s Manual - Chapter 3. BUILDING LED STRIPS DISPLAY USING PIXBLASTER CONTROLLER. We also assume the WS2812B 3-wire LED strips.

The first initialization sequence will select the video input image’s part as shown in Figure 4, with the left top corner placed in (0, 0) pixel position

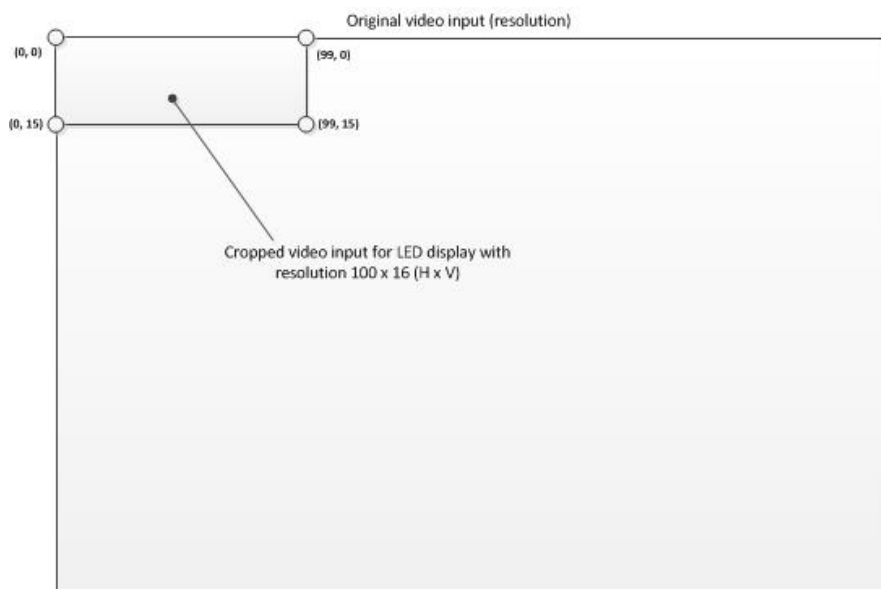


Figure 4. Video Cropping of 100x16 Video Window for LED Display

The second initialization example will show how to change the position of the cropped video for showing on the LED display. In this example (Figure 5), the top left corner will be placed in (99, 99) position. Other display settings will remain unchanged.

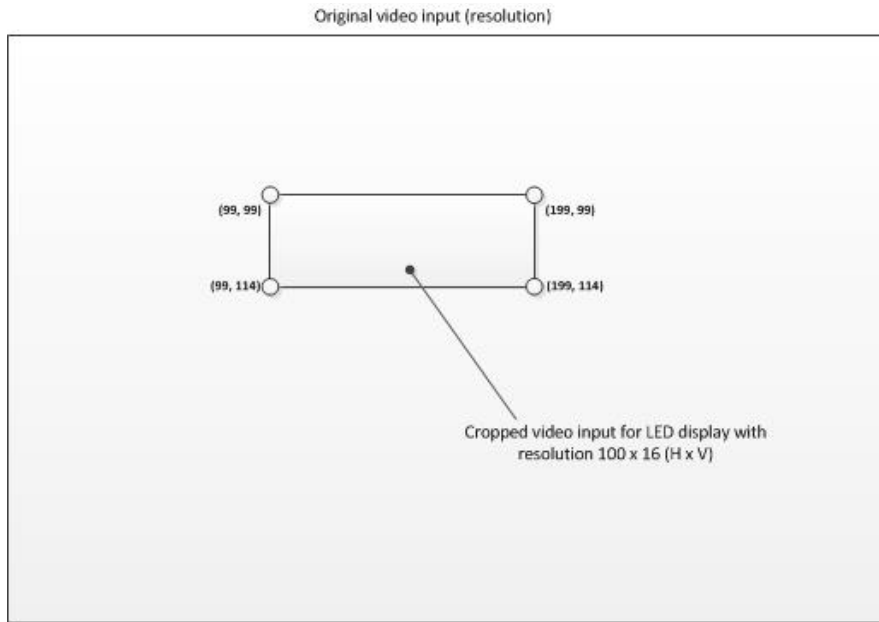


Figure 5. Moved Position of the Cropped 100x16 Video Window for LED Display

Quick Start - Step by Step

- Select the general operation mode by on-board DIP switches. You can select master and slave operation modes, 3-Wire (WS2812B like) and 4-wire* (APA102 like from 2Q2021) LEDs

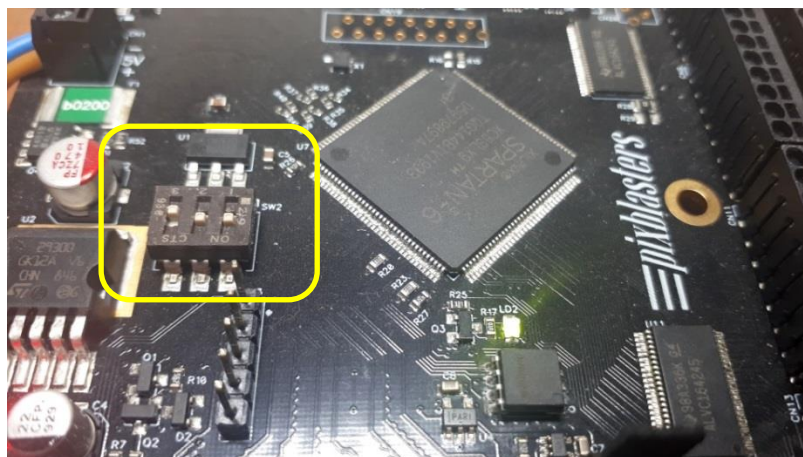


Figure 6. On-Board DIP Switches Set To Master Configuration*

** For more info about the DIP switches and all other initialization details, please consult the User's Manual*

Please use configuration 001 instead of 011 shown in Figure 6. To set up this configuration, please push the middle switch in the opposite position.

- Connect the control computer and the Pixblasters MS1 with the Mini-B USB serial cable.
- Connect the +5 VDC power supply to the blue power terminal on the MS1 controller
- Switch-on the MS1 board with the on-board power switch (the RED LED must be ON)
- Start the serial terminal application on your control computer. Select the proper serial port and setup communication parameters to 115200 8 0 1 0.
- The Pixblasters User’s Menu should pop-up in the serial terminal window

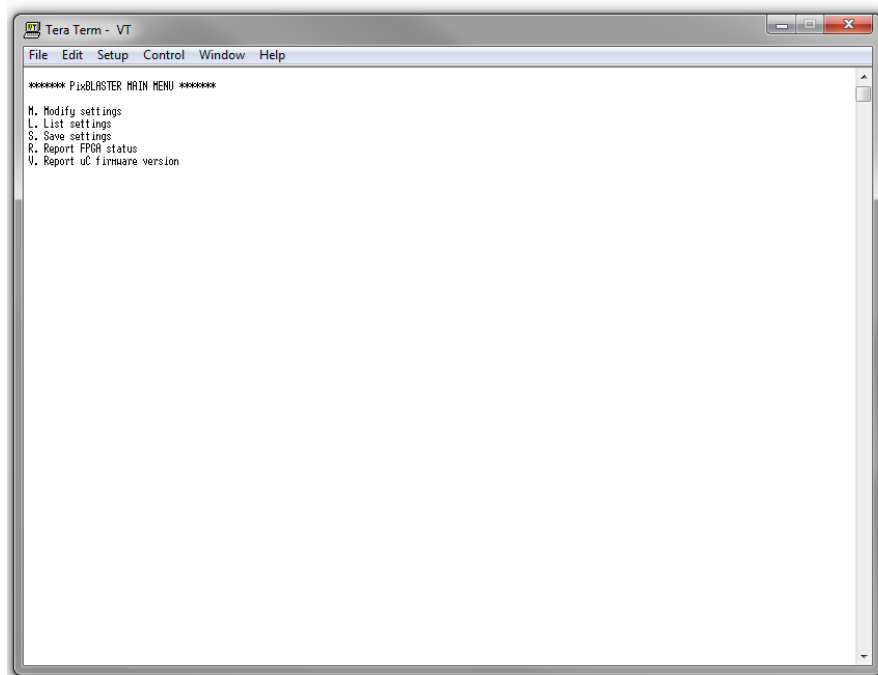


Figure 7. The Pixblasters User’ Menu in the Serial Terminal Window

- Hit ‘L’ to list the content of internal registers that must be properly setup for the specific LED display configuration
- Depending on the board’s firmware, the content of the listed internal registers can be all 0s or can be initially setup to some values (a change planned for the end of 1Q21)

CONTROL	0x00
CROPX	0x00
CROPY	0x00
STOREX	0x00
STOREY	0x00
STOREHRES	0x00

STOREPRESCAL	0x00
PROGLUTS	0x00
SEGMENTSNO	0x00
CFGLOADCTRL	0x00
AUX1, AUX2	Reserved

- Please find the full explanation of internal registers in the User's Manual:
http://pixblasters.com/wp-content/uploads/2020/03/Pixblasters-MS1-Users-Guide_v1.0.pdf
- To start changing values written in internal registers, please hit the 'M' key. To select the specific internal register, hit the number or the letter assigned to register's name
- For the initial configuration described by Figure 4, leave the registers CROPX and CROPY at 0 values
- To define the width of the LED display to 100 pixels, insert the value 99 in the STOREX register
- To define the height of the LED display to 16 pixels, insert the value 15 in the STOREY register
- Define how many pixels should be stored in a single line by writing 100 in the STOREHRES register. This register can be programmed by a value different from a horizontal LED display resolution when the display use segmented lines. Please consult the User's Manual.



- STOREX won't change the value if the STOREHRES is not written to!
- STOREHRES must be properly setup, i.e. STOREX must be always smaller or equal to STOREHRES

- Other register values should not be changed, except the CONTROL register
- Write 1 into the CONTROL register to enable the LED video controller
- Hit 'E' to exit the sub-menu
- Hit 'M' to permanently store new register values. If you omit to save the new values, all changes will be ineffective.
- The list of new and stored register values can be listed by the 'L' key. The values should be as listed:

CONTROL	0x0000
CROPX	0
CROPY	0
STOREX	99
STOREY	15
STOREHRES	100
STOREPRESCAL	0
PROGLUTS	0
SEGMENTSNO	0
CFGLOADCTRL	0
AUX1, AUX2	Reserved



Please note the value 0x0000 in the CONTROL register. In the read-back mode, this register shows the status of the input video, not the value 1 written in previous initialization steps.

- With this initialization in place, once when you start the LED display with the Pixblasters MS1 controller fed by a valid video input, the LEDs will display crispy video image
- Sometimes the LED strips have different colors order. For example, if you notice that image parts support to be red looks green, it is probably the GRB LED strip
- The coloring can be changed from the RGB into GRB colors order by writing hexadecimal value 0x0141 in the CONTROL register. To learn more about this feature, please check the User's Manual – Chapter 7. Internal Registers
- The last step in this configuration example from the Figure 5 – move of the cropping window
- Hit 'M' to modify internal registers
- Write 99 in the CROPX register
- Write 99 in the CROPY register
- Hit 'E' to exit submenu and 'S' to save new values
- The image part displayed by LED s will be moved to the new position

Recommendations and Conclusion

Pixblasters initial configuration is very easy and straightforward. It must be executed only once if the LED display and the digital signage application that generate the video content do not change over

the time. This application note does not cover the configuration of the LED display built by LED strips used in the segmented mode. More about that use case can be found in the User's Manual. You can also visit www.pixblasters.com to find more configuration examples.

For instructions on how to build a simple, yet very powerful video LED display, please check out this video clip: https://www.youtube.com/watch?v=dWsm_X-7bco

The control logic used in this video clip is capable to control very large video displays that can span over complete buildings. For more video clips, please visit: <http://pixblasters.com/videos/>

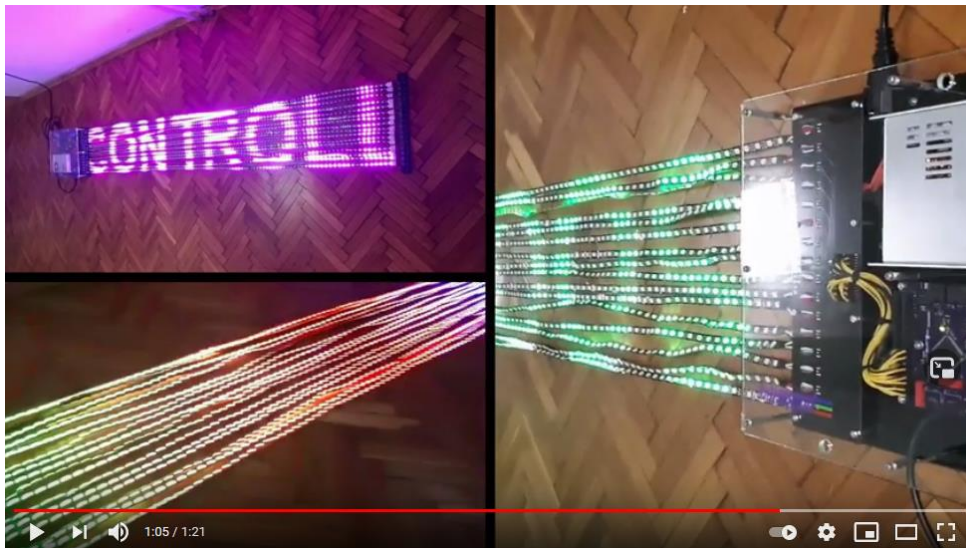


Figure 8. Build Up of the Pixblasters Micro Demo – Click Photo to Play Video

Revision History

Version	Date	Description of Revisions
1.00	12.02.2021.	Initial public release.
1.10	13.05.2021.	Use 001 instead of 011 FPGA configuration. Some production boards have 011 flash sector empty. In that case, the board behaves differently from the described and expected behavior.