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 interface. Non-initialized LED controllers cannot display correct 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 (i.e., the number of LED outputs per horizontal LED band), and with the exact part of the input video for the LED display. Additionally, the MS1 Video LED Controller must be configured via on-board DIP switches 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/uhBz0K_IGW8.
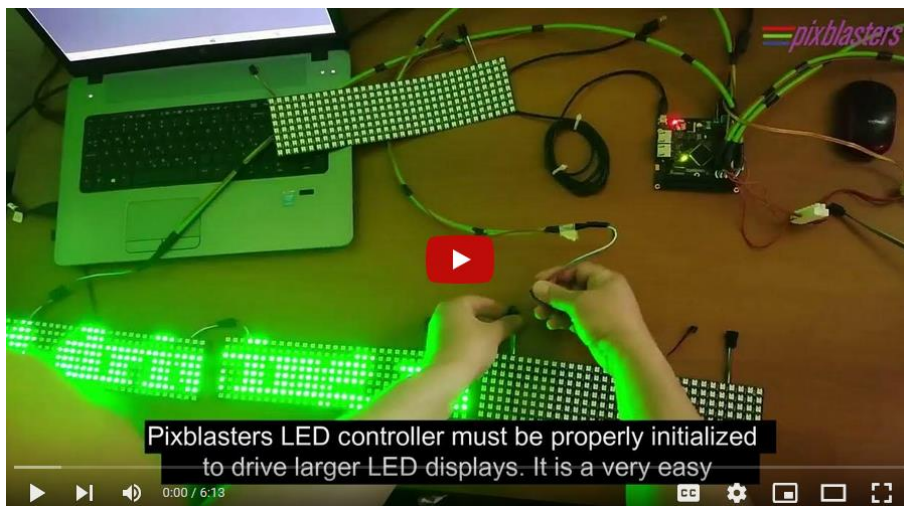

Figure 1. Quick Start Guide - Click on Photo to Play Video

The initialization is very simple and can be done within a couple of minutes. It is also permanent, as the initialization parameters remain stored in on-board memory. If the LED video display's architecture, such as the number and organization of connected LED panels, does not change during its lifetime, the Pixblasters MS1 Video LED Controller's initialization only needs to be executed once!

The software initialization runs on any control computer and any operating system that supports a simple serial terminal emulation program. The Pixblasters development team preference is Tera Term, an open-source and free terminal emulator program: https://teratermproject.github.io/index-en.html.

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. After initialization, the control computer and the USB serial cable can be permanently disconnected.

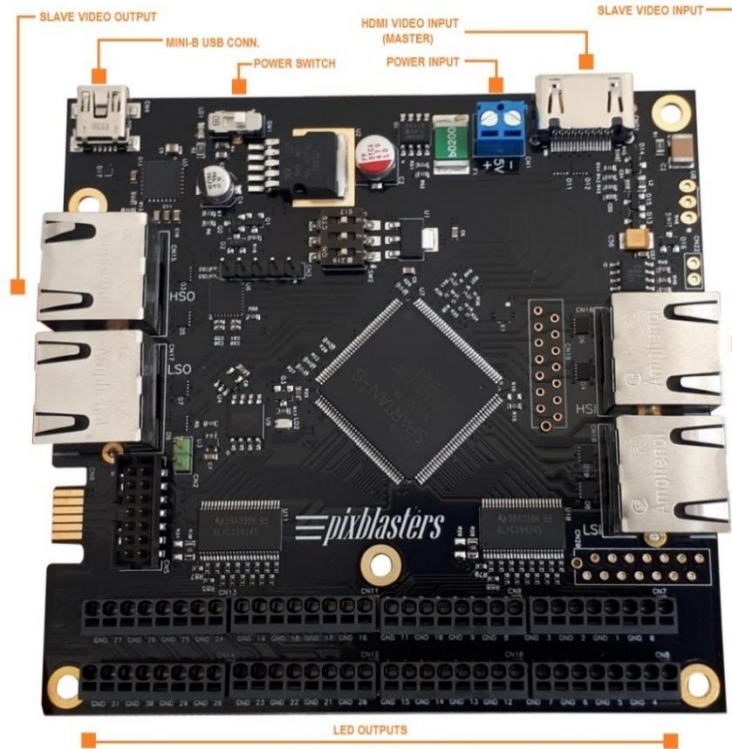## Pixblasters MS1 Controller - Important Terminals

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 selected image part for the LED display, as shown in the next figure, and drives the LED panels or 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.

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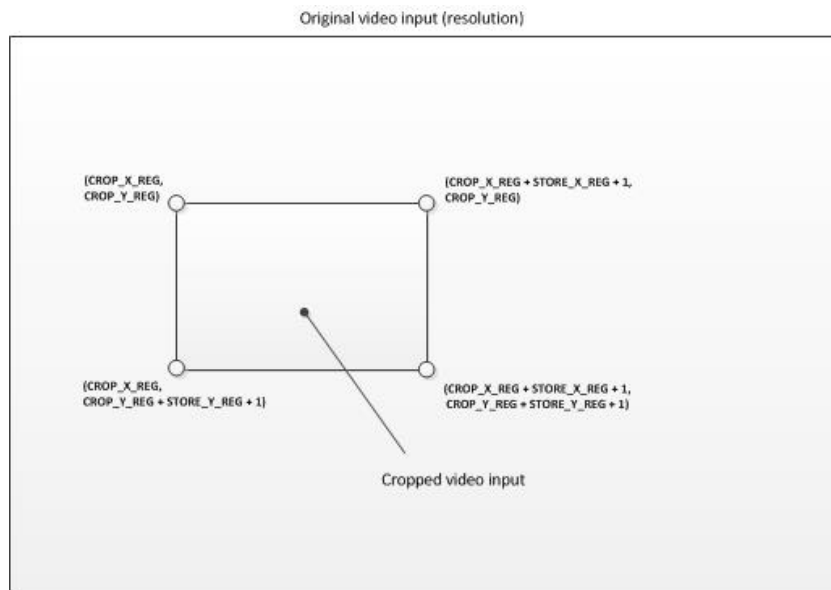
Figure 3. Explanation of Video Input Cropping

In the following paragraphs, this document explains the Pixblasters initialization for a video LED display built with 16x16 panels. The display's resolution is 128x80 pixels. The top left pixel of the video LED display should correspond to the video pixel of the video source at position (399, 399).

To select this exact portion of the video input into Pixblasters LED controller, the following registers should be set to:

CROPX	0x0399
CROPY	0x0399
STOREX	0x0127
STOREY	0x0079
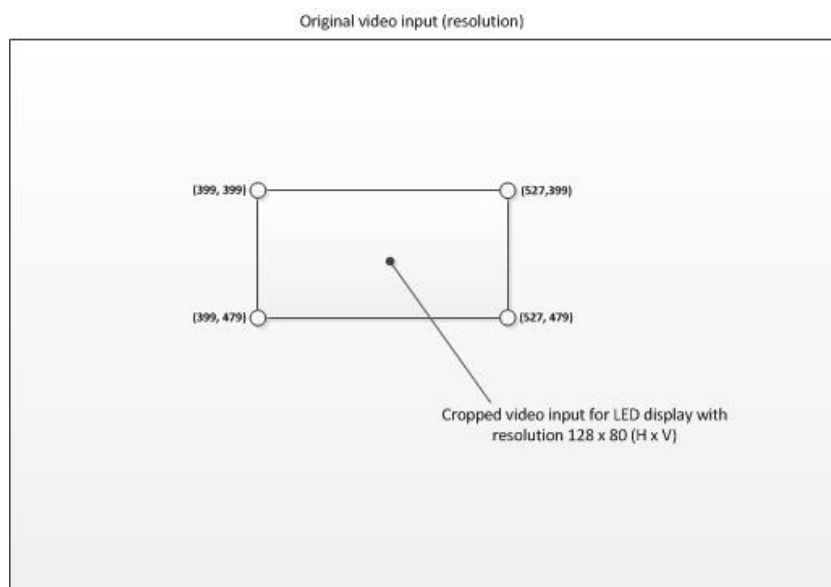
Figure 4. Video Cropping of 128x80 Video Window for LED Display

Example Video Display – 128x80 Built by 16x16 LED Panels

The example video display with resolution 128x80 requires 40 16x16 LED panels arranged in 5 rows with 8 panels in each row. A single LED output can drive two 16x16 LED panels and four outputs must be configure to drive the complete horizontal LED band.
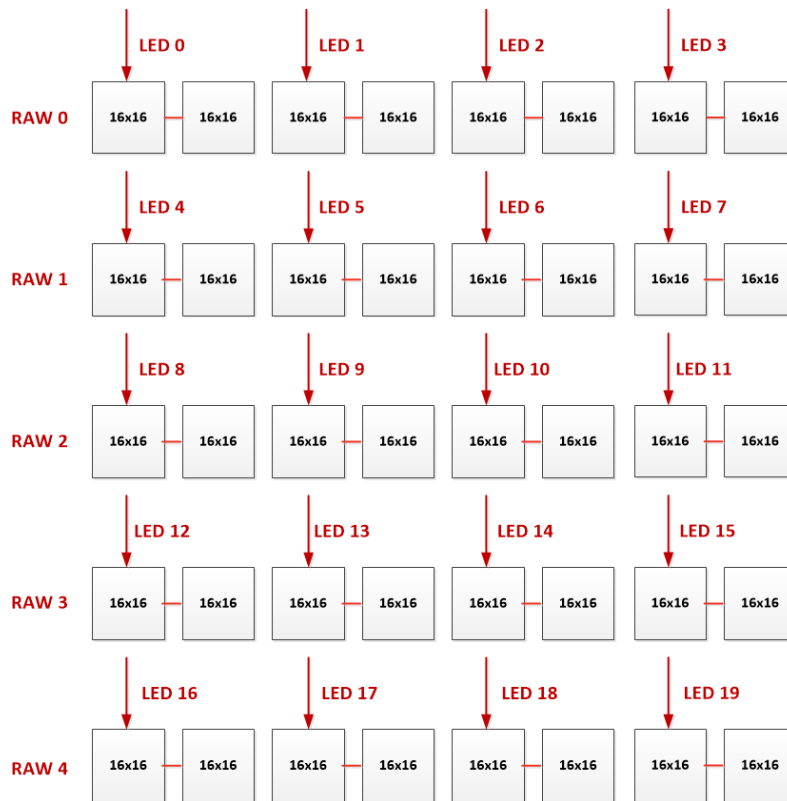

Figure 5: 128x80 Video Display Assembled with 16x16 LED Panels

The following table shows the content of the Pixblasters controller's internal registers properly set up for the example 128x80 video LED display. Grayed rows can be configured differently, and white rows show must-have register values.

CONTROL	0x0141
CROPX	399
CROPY	399
STOREX	127
STOREY	79
STOREHRES	512
STOREPRESCAL	0
PROGLUTS	0x0000
SEGMENTSNO	4
CONTCFGLOADCNTRL	0x0000
AUX1	0x001F
AUX2	0
MAT_H	15
MAT_V	15
MAT_CFG	0x0011

Quick Start - Step by Step

- ▪ Select the general operation mode by on-board DIP switches. To drive LED panels as the Master controller, the DIPs should be set to configuration 5 (101).
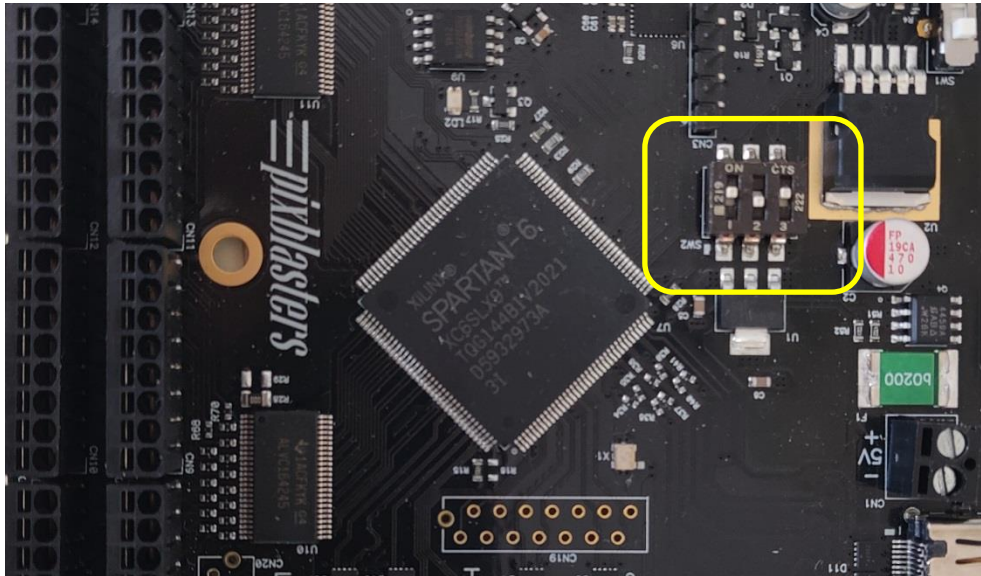

Figure 6. On-Board DIP Switches Set To Master Configuration*

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

- ▪ 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.
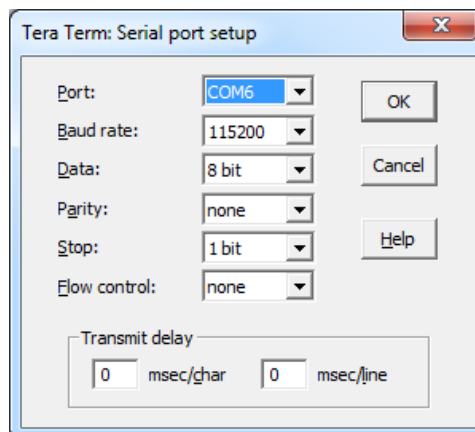

Figure 7. Correct Serial Connection Parameters

- The Pixblasters User's Menu should pop-up in the serial terminal window
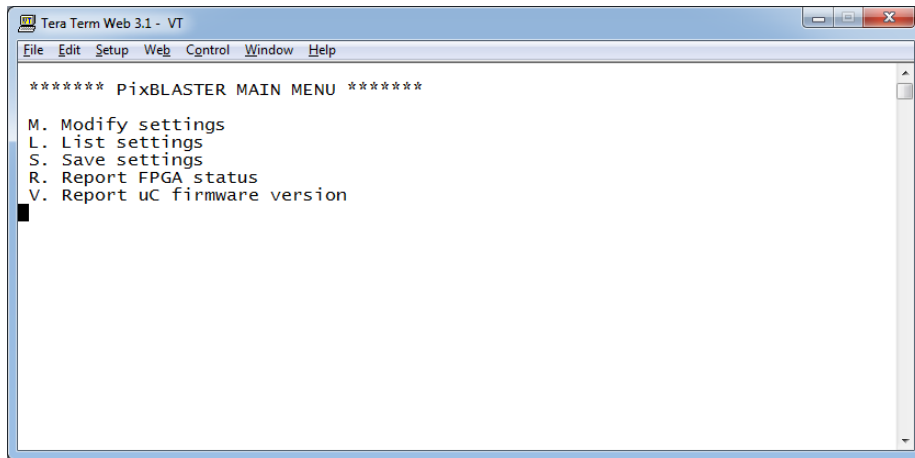

Figure 8. The Pixblasters User' Menu in the Serial Terminal Window

- Hit 'L' to list the content of internal registers that must be properly set up for the specific LED display configuration
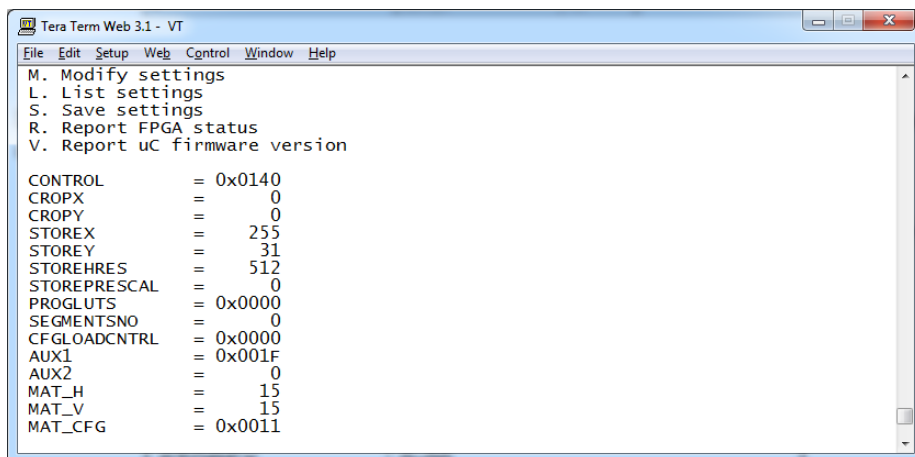

Figure 9. Listed Default Values of Internal Registers

- Please find the full explanation of internal registers in the User's Manual: https://pixblasters.com/documents/

- To start changing values written in internal registers, hit the 'M' key. To select a specific internal register, hit the number or letter assigned to the register's name. For example, hit 1 to change CROPX register and enter 0399 (as explained in the previous paragraph)

- To fully understand how to build video LED displays with LED panels, please read the User's Manual or the application note PAPP006 - How to Build Video Displays with RGB LED Panels

- A single Pixblasters LED controller can drive two 16x16 LED panels. Four adjacent LED outputs must drive the LED band of eight 16x16 LED panels to achieve a horizontal resolution

of 128 pixels. Register SEGMENTSNO = 4 defines the use of four video outputs for driving such an LED band.
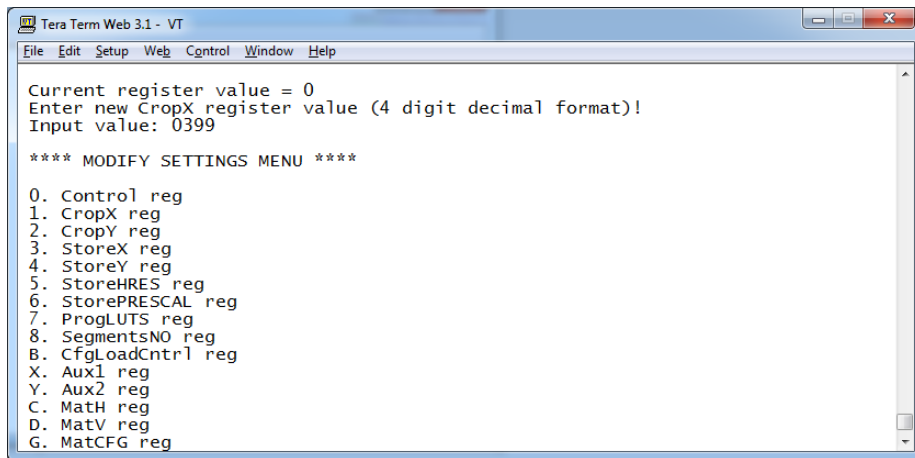

Figure 10. Example Modification of Internal Registers

- After setting all the registers to the desired values, it is necessary to save the new values. Hit 'E' to exit the modification menu, and then hit 'S' to save the new values. Select 'Yes' and the new registers' values will be permanently stored on the board.
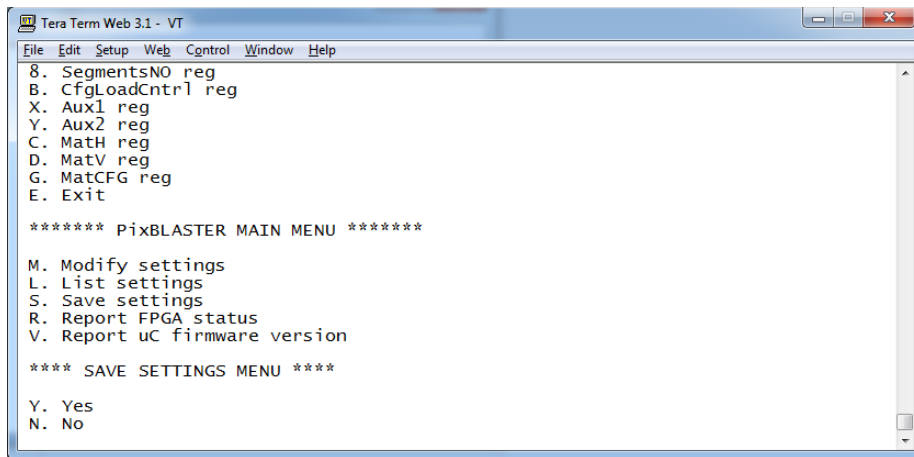

Figure 11. Save New Register Settings

- If you accidentally skip saving the new values, they will not be stored!

- Hit 'L' to check the initialization for the targeted 128x80 video display. It should look like shown on Figure 12.

Please note the value 0x0140 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. If the video input is valid, the register will show 0x0141.
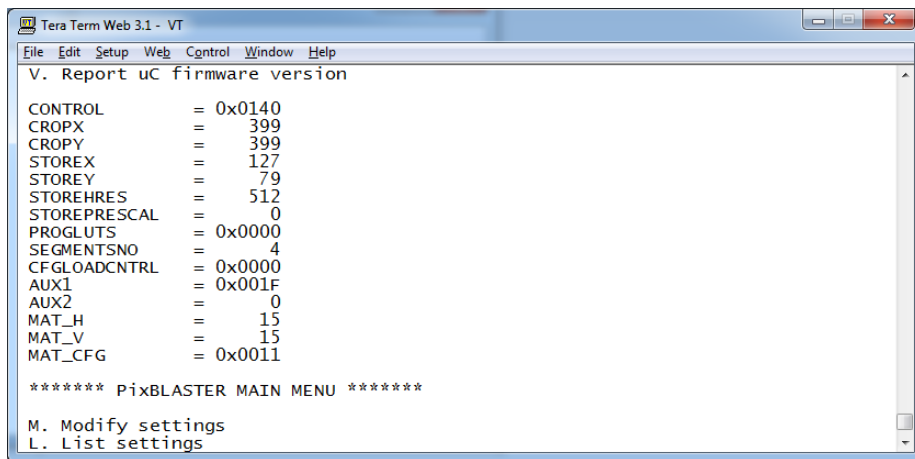
Figure 12. New Values of Internal Registers for 128x80 Display

- With this initialization in place, once you start the LED display with the Pixblasters MS1 controller fed by a valid video input, the LEDs will display a crisp video image.

- Sometimes the LED panels have different colors order. For example, if you notice that image parts support to be red looks green, it is probably the RGB LED pixel organization

- The coloring can be changed from the GRB into RGB colors order by writing hexadecimal value 0x0001 in the CONTROL register. To learn more about this feature, please check the User's Manual.

Changing the Pixel Mapping Matrix

- Pixblasters MS1 Video LED Controller is pre-programmed to drive 16x16 LED panels. If you want to use it with other types of LED panels, the pixel mapping matrix stored in the on-board flash memory must be re-programmed
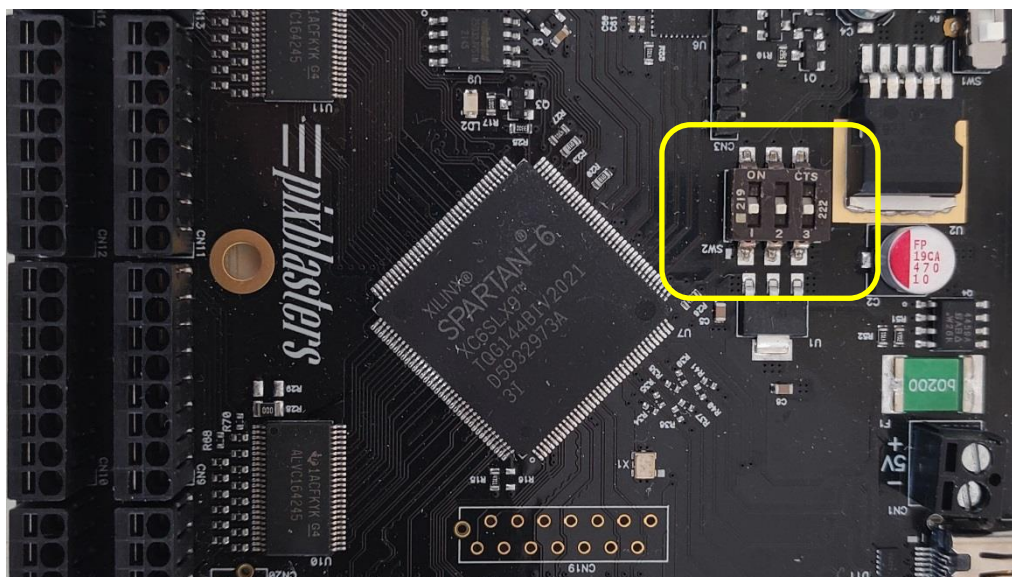

Figure 13. On-Board DIP Switches Set To Flash Update Configuration 0

- To update the flash memory content, please set the on-board DIP switches to Configuration 0 (000). The board must be switched off when you alter the DIP switches.

- Switch the board on and connect via serial terminal. The following menu will appear:
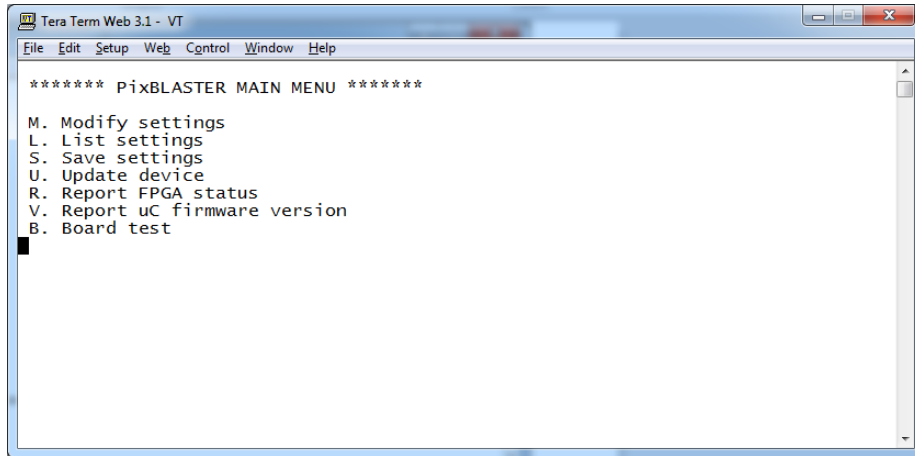

Figure 14. The Main Menu in Configuration 0

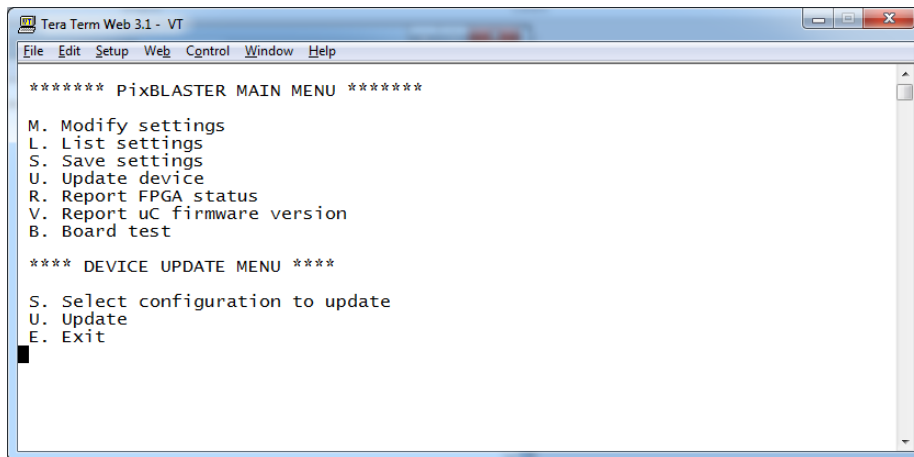- Hit 'U' to update device and the following menu will appear:

Figure 15. Device Update Menu

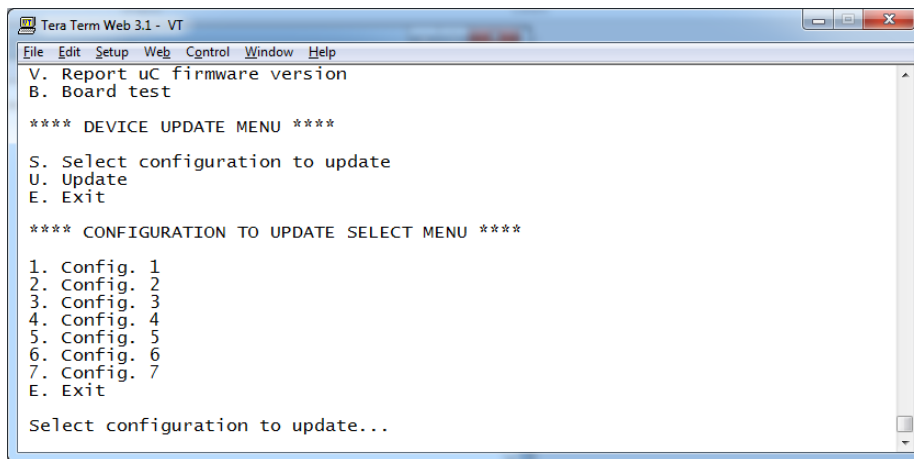- Hit 'S' to select the configuration to update. It must be Configuration 7.

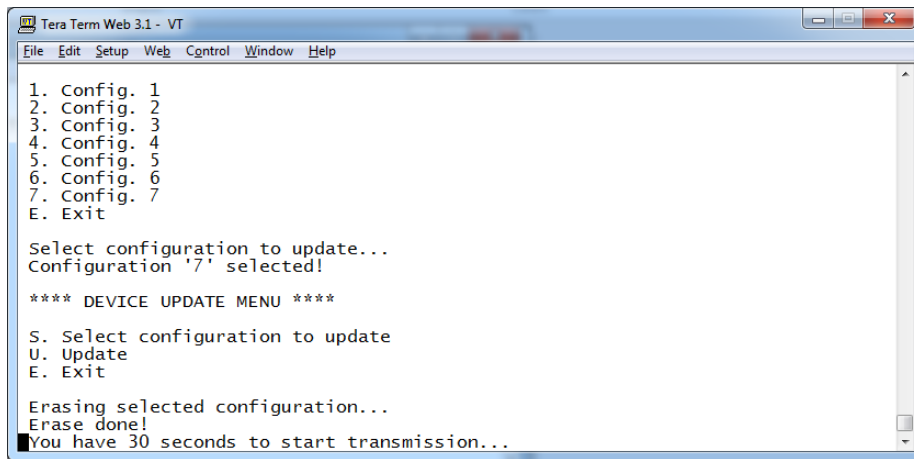**Figure 16. Select the Configuration 7**

Figure 17. Prepare for Programming New File to On-Board Flash

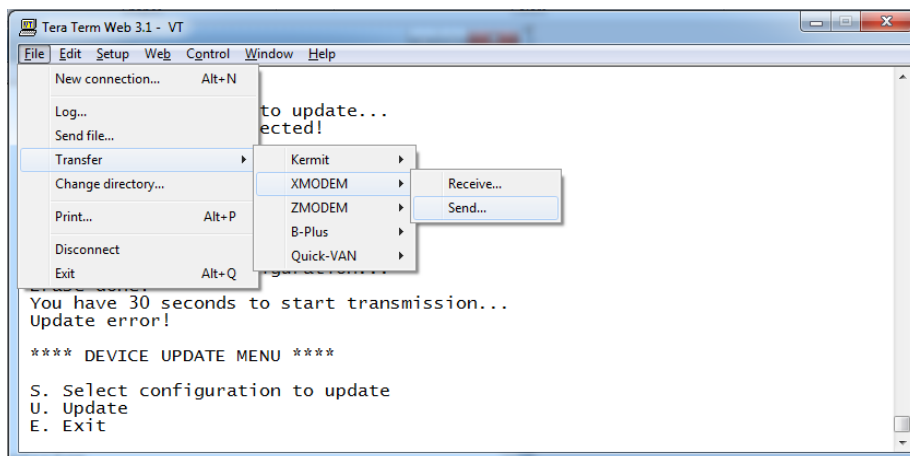- From the **File** menu select **Transfer-XMODEM-Send**

Figure 18. Use XMODEM to Transfer the Pixel Mapping Matrix

- Pixel mapping files can be downloaded from https://pixblasters.com/deliverables/. If you want to connect an LED panel that is not listed as supported by Pixblasters, please contact us directly at info@pixblasters.com and we will add support for that specific LED panel.

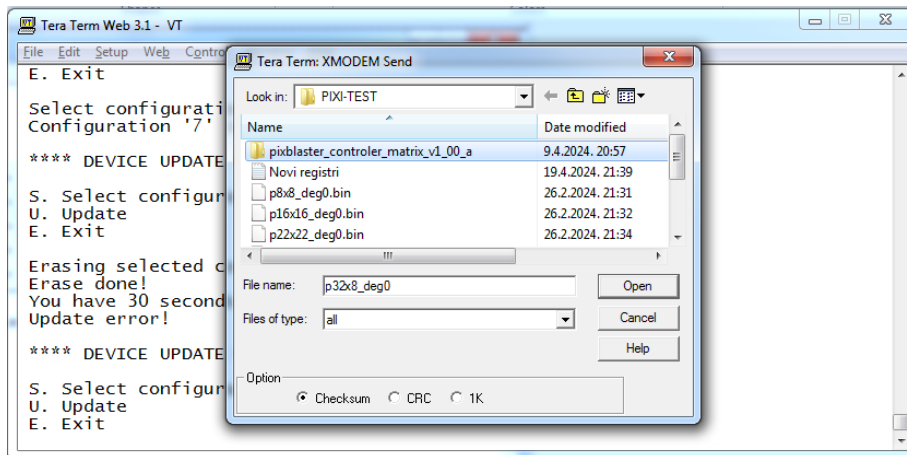- For example, to drive 32x8 LED panel, please select the file p32x8_deg0.bin

Figure 19. Select the BIN File for the Specific LED Panel Type

- Wait for configuration update to begin. Depending on the type of the terminal emulator software, you will see different forms of the progress bar at the screen.
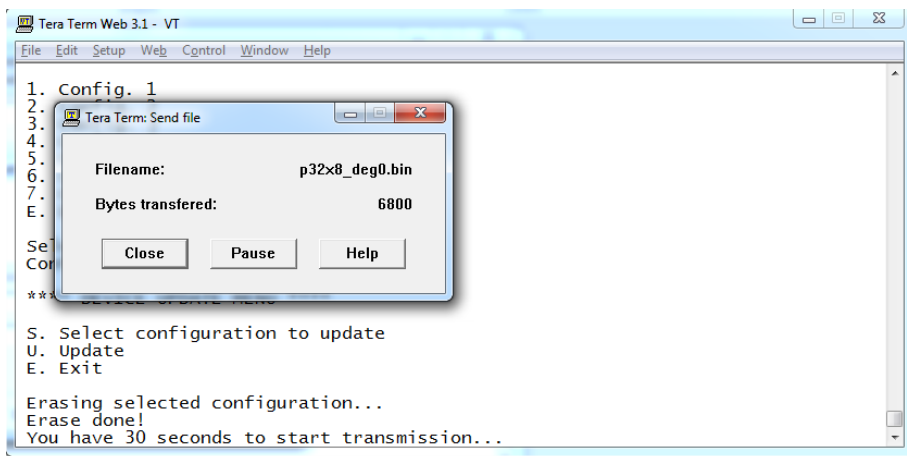

Figure 20. Monitor the Update Process

- The successful update will be confirmed by the print message "Update done!"

- Hit 'E' to exit the update mode. Switch off the board and switch DIPs into position 101 for driving LED panels.
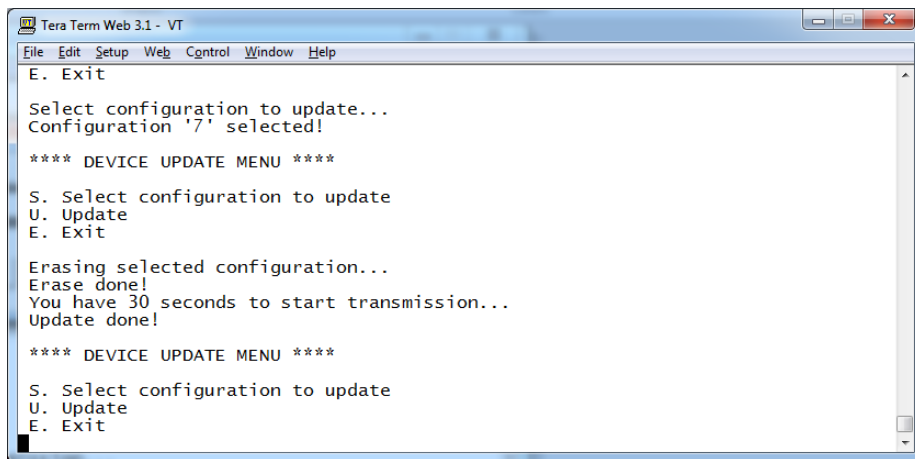
Figure 21. The Updated Successfully Completed

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.

For instructions on how to build different video LED displays, please read the application note PAPP006.

Revision History

Version	Date	Description of Revisions
1.00	18.06.2024.	Initial public release.