SanDevices Version 5 Firmware Preliminary Documentation

This is preliminary documentation for SanDevices version 5.xx firmware.

Version 5.023 11/08/2016 inter-frame gap lengthened for 1804/281x class pixels to accommodate WS2813s

For vers 5.019 08/18/2016

Version 5.019 adds a new system command 22. System command 22 forces all universes to be 512 bytes and forces all output types to be type 6818 RGBW pixels. See “Important Information concerning universe sizes” for additional information.

Version 5 is a major firmware update for the SanDevices pixel controllers including the E682 and E6804. It is also compatible with earlier controllers (E680 and E681) that have been upgraded to the Wiznet W5200 Ethernet module.

Note: 2 existing version 4 features are not presently implemented in version 5. These are support for TLS3001/CYT3005 pixels, and gamma correction.

Presently the total supported channel count is unchanged from version 4 at 12 universes or 6.144 channels. It is hoped that this channel count will be increased to 16 universes is a later v5 release.

New features in version 5:

Many E682 configuration parameters that previously applied to an entire group of 4 outputs, can now be done independently for each output. These include: RGB color order, string length, start address, group size, and zigzag parameters.

New pixel types supported, including support for RGBW pixels. The following pixel/output types are asupported:

1804/28//2812 and compatibles, 6803, 2801, 16716, 880x, 981x, APA102, 6818 (RGBW), GE Color Effects.

DMX outputs, both channel-based and pixel based, are supported as well as the Renard protocol.

There is support for RGBW pixel types, both in 4-channel (separate R, G, B, and W channels) mode and in RGBw derived white mode. In this mode the controller receives R. G. and B channels and calculates a W value from those. This allows use of RGBW pixels with RGB software.

Output length is now specified in CHANNELS for channel-based outputs such as non-pixel DMX and Renard, and in PIXELS for pixel-based outputs.

Specific timing of the pixel data output for 3-wire pixels can be specified in increments of 50ns.

Each received universe can be specified as being either 510 or 512 channels. 510 channel universes are preferred and often required for 3-channel (RGB) pixel outputs since 510 channels = exactly 170 pixels. RGBW pixel outputs should use 512 channel universes and MUST use 512 channel universes if pixel addresses cross a universe boundary.

Important Information Concerning Universe Sizes: If you will not be using RGBW pixels it is strongly suggested that all universe sizes be set to 510 channels. It is recommended that on a controller that will use both RGB and RGBW pixels, you should first define a group of 1 or more consecutive 510-channel universes for the non-RGBW outputs (DMX outs or RGB pixels) and then define a group of 1 or more consecutive 512 channel universes for the RGBW pixels. This will prevent issues that will occur if a pixel string's addresses cross a "wrong size" universe boundary. For example, if you assign a string of 171 RGB pixels to a 512-channel universe, the last pixel will use channels 511 and 512 of that universe and channel 1 of the next universe. Some pixel driving programs, Madrix is one example, do not allow channels of a pixel to be split across a universe boundary.

A similar situation would occur if RGBW pixels crossed the boundary of a 510 channel universe.

Universe sizes should be set **before** entering output start addresses since altering the size of a universe will shift starting addresses of outputs using higher universes.

Please note that test patterns will work properly ONLY for 510-channel universes and ONLY for RGB pixels and will produce incorrect patterns for 512 channel universes or any universes following a 512 channel universe. That's why it is preferable to define the 510 channel universes first.

System command 20 will force a default setup where all universes are set to size 510 and system command 22 will force a default setup where all universe sizes are set to 512.

A controller name field has been added to the web page as an aid to identifying which controller is being accessed in multi-controller installations.

Subnet mask is now programmable instead of being calculated automatically based on IP address range.

A Power Limiter feature has been added. This allows the user to specify the maximum allowable power consumption of the pixels, and if that value is exceeded the display intensity is automatically throttled back. This is useful for installations where the power supply capacity is sufficient to drive all pixels at full intensity white.

The intensity of each individual output can be configured as 100%, 50%, 25%, or 12%. This allows control of the overall display brightness as well as matching of brightness between different pixel types.

There is no longer a limit as to the number of channels that can be assigned to a single output.

A chase mode has been added as a variant of grouping.

The zigzag option has been enhanced to allow the first segment size to be specified separately from other segment sizes. This allows use of the zigzag feature on a matrix where the string length is not an even multiple of the matrix dimension.

Because of the added configuration options, the web interface now has 2 pages, one devoted to output-specific information.

Known bugs:

The controller name input entry has issues.

Flicker in RGBw mode of type 6818 pixels.

The ending address universe number may display as 65535 after loading factory default setup.

Not all combinations of grouping/chase/reverse are working correctly.

End address channel number is not calculated correctly if the group size doesn’t divide evenly into length.

Test patterns will work properly only for RGB pixels and 510 channel universes.

User Interface

Main Page

System Information

Note: This discussion assumes that the user is familiar with the version 4 user interface and will primarily focus on changes from version 4.

Subnet Mask is now a user-defined field, entered in much the same way as an IP address. Previously the Subnet Mask was determined automatically based on the IP address. For installations where the IP address negins with “192” the proper subnet mask is 255.255.255.0.

Controller Name is a new entry field. This is helpful when the user has multiple controllers. It is a 16-character alphanumeric entry.

Receive Mode is a drop-down where you can select Multicast E1.31, Unicast E1.31, or Art-Net.

Timeout, if set to a non-zero value (2-99) will turn off all outputs after the number of seconds has passed with no incoming data being received.

Test Pattern is now a drop-down. Choices are RED, GREEN, or BLUE (full intensity), RED, GREEN, or BLUE (dimmed with a single full intensity pixel chasing through the entire display). 25%, 50%, 75%, or 100% intensity white, and Red. Green. Blue. Off chases with from 1 to 5 pixels per color segment.

Gamma Correction is not presently implemented.

Power Limiter. This is a new feature that allows the controller to set a limit of total power drawn by the pixels. This is primarily intended for installations where the power supply capacity is sufficient to drive the show, but not enough to support 100% intensity white on all pixels. By setting an appropriate Power Limiter value, the controller will automatically throttle back the intensity of the entire display as needed to maintain pixel power consumtion below the specified value.

In this implementation, all outputs are summed to calculate the total power draw, and it is assumed that all outputs are driving pixels with the same or similar power rating. In the future this feature may be enhanced to specify pixel power on a per-output basis, to allow for use of different pixel types with different power consumptions, and to eliminate some outputs from the power calculation if the loads on that output are powered from another source (DMX outputs for example).

The Power Limiter parameter represents the maximum number of full intensity pixel CHANNELS. Here is a sample configuration. Assume that the installation uses 12V pixels that draw 10ma per channel at full intensity. Each pixel channel then corresponds to 120mw of power (12 volts X 10ma). Assume that we have a 350W power supply powering the controller. 350 watts divided by .120 watts per channel = 2917. The total number of full intensity pixel channels that the power supply can support. This is the value that would be entered into Power Limiter.

If at any time the total power drawn by the display exceeds the equivalent of 2.917 full intensity pixel channels, the controller will automatically cut the display intensity in half to insure that the power supply is not overloaded.

NOTE THAT ANY CHANGES TO THE PREVIOUS VALUES SHOULD BE FOLLOWED BY CLICKING “SAVE SYSTEM INFO” TO MAKE THE CHANGES PERMANENT.

In the Universe Settings section of the page there is a new drop-down for universe length. The choices are 510 channels or 512 channels. In general, it is suggested to set all universes at 510 channels initially. It should only be necessary to select 612 channels as a universe length if you are using RGBW pixels. In that case you should set the length of those universes that are used by RGBW pixels to 512. Please note that built in test patterns will produce incorrect patterns on 512 channel universes. When possible, you should configure the addressing such that RGB and RGBW pixels do not share the same universe.

As with version 4, the 8th through the 12th universes are only applicable for input modes of Art-Net or Unicast.

Note that there are separate "save" buttons for universe numbers and for universe sizes. Please click the appropriate SAVE button after making changes.

Output Group Configuration.

This is where settings are made that correspond to an entire output group. For an E682 each output group represents 4 individual outputs. For an E6804 each output "group" id only 1 output, so the use of "group" is a bit of a misnomer for E6804s.

The user selects output type. This can be a pixel type or a protocol type (DMX, RENARD). Note that some pixels and protocols have multiple type selections. For example there are 2 choices for type 6818 RGBW pixels. The first is RGBW (upper case W) and in this case the controller expects to receive 4 separate intensity values per pixel. In RGBw mode (lower case w) the controller expects to receive only 3 data channels per pixel (R, G, and B) and the controller calculates the value for the W channel.

After selecting an output type the web page will show whether the length for the outputs in this group will be specified in pixels or in channels, and how many channels correspond to each unit of output length. Also there is a TIMING drop-down for each output group. The selections in this drop-down will vary according to the output type. Therefore you will need to specify the OUTPUT TYPE first, then click SAVE. Then you can select the timing value if needed and click SAVE again.

The TIMING value is primarily used for 3-wire pixels such as type 1804/2811/2812/INK and compatibles. The timing value can be selected between 150ns and 500ns in increments of 50ns. This selects the duration of the logic 1 signal for a 0 data bit (referred to as T0H in the pixel data sheets). The remainder of the bit timing values are derived from this value. The provided range should allow foe the support of virtually any pixel that uses the "1804/2811" class timing. You can experiment freely with different values.

For 4-wire (clocked) pixels the TIMING value is the SETUP delay, the time between setting the data line and asserting the CLOCk signal. Typically clocked pixels will work fine for any TIMING setting.

Some pixels, such as the GE ColorEffects, do not allow any timing variations.

For type DMX outputs, the timing entry serves a special function. It allows you to select whether the controller sends the number of DMX channels specified by the output's LENGTH setting, or forcing the controller to always send 512 channels.

For type RENARD outputs, timing allows baud rate selection of 57.600, 115,200, or 230,400.

There are several buttons at the bottom of the main web page:

REBOOT controller restarts the controller

SHOW OUTPUT PAGE displays the output-specific user interface web page

SYSTEM COMMAND executes the specified numeric system command:

10 clears all configuration memory and resets to default values

20 sets a test configuration with all outputs as type 2801 pixels

30 sets a default “as shipped” configuration

90 forces generation of a new MAC address and restores all network configuration to factory default. The IP address will be 192.168.1.206.

The SHOW OUTPUT PAGE button at the bottom of the main page will display the OUTPUT page.

The OUTPUT page allows you to configure the values that can be selected on a per-output basis. The output number and output type are displayed to the left (output type having been selected on the MAIN page).

The first user-settable entry is LENGTH. LENGTH is specified as a number of pixels for RGB or RGBW outputs, or as a number of CHANNELS for non-pixel DMX or RENARD outputs.

The next entry is a drop-down that allows selection of color order for RGB and RGBW outputs. Separate drop-down lists are provided for RGB outputs and for RGBW outputs. Note that for RGBW outputs the W channel is always assumed tyo be the last channel.

Start address is specified in terms of a starting universe number (drop-down) and a starting channel number within that universe. The universe numbers that will appear in the drop-down are the 12 universe numbers entered in the Universe Selection section of the main web page. Starting channel numbers for RGB pixel outputs should alwys be 1, 4, 7, 10, 13 etc. Starting channel numbers for RGBW pixel outputs should be 1, 5, 9, 13, etc. This is necessary in order to avoid splitting channels of a single pixel across a universe boundary.

End address is calculated automatically based on start address and output type, and is displayed. Typically you would use the end address of the previous output to set the start address of the next output (prior end address plus one).

The REVERSE check-box indicated that this output should be driven in reverse. In other words, the pixels will light as if the controller was actually attached at the other end of the string.

Null pixels are sometimes used when the data line between controller and pixel string is unusually long. The length of this wire is limited because the data signal degrade to the point of being unuseable if sent over a wire that is too long. Since a pixel regenerates the data signal, it’s possible to drive a very long distance by inserting dum,my “null” pixels perhaps every 20 feet or so. Whatever number of such null pixels used is entered into the NULLS va,lue. The controller automatically skips over those pixels and leaves them dark.

GROUP SIZE allows driving pixels in groups rather than individually to reduce channel count and/or programming complexity. If you specify a GROUOP size of 5, then the controller lights each group of 5 pixels as a single pixel, and the channel count is cut by 80%.

There is now a new grouping mode called CHASE. CHASE is a check box. If checked, it indicates that the pixel pattern should repeat every GROUP pixels. Say you have a 50-opixel string and select GROUP=5 and CHASE=ON. That output will be treated as if it is only 5 pixels long and the data that is sent to the first 5 pixels of the string will be repeated over and over. For example if you light pixel #1 RED, then pixels 6, 11, 16, 21, 26 etc will also light RED.

The ZIGZAG feature has been enhanced in version 5. It is now possible to specify 2 zigzag lengths. The first specifies the length of the FIRST zigzag segment, the other specifies the length of all other zigzag segments. This allows the use of the ZIGZAG function on an array where the dimension of the array doesn't divide evenly into the length of the pixel strings.

DIMMER allows scaling the intensity of all channels of this output to 100%, 50%, 25%, or 12% of full intensity. This can be used to limit the overall display brightness or can be used to obtain a better intensity nmatch between different pixel types.

As in other cases, after making changes, click the SAVE button.

There is a DHOW MAIN PAGE button at the bottom of the output page to return to the main web page.