

NLED Pixel Controller Mini

The NLED Pixel Controller Mini supports several of the most popular pixel types and has the ability to accept standard DMX-512, in addition to TTL serial signals from a computer, microcontroller, Arduino, XBee or other TTL serial devices. Several configuration options, such as pixel IC type, amount of pixels to control, reception baud rate, and end-of-frame spacing can be customized to work well with your project. All configurations are changed over the serial connection header or through the DMX hardware(RS-485) using a compatible serial adapter or DMX transmitter. This small(1.5" x 1.5" x 0.5") design is great for small amounts of pixels for DMX control, strands, rope style lights, or even low-pixel LED matrices. Serial control is compatible with NLED Matrix, the Java based open-source LED Matrix control and mixing software.

Usage Modes:

DMX-512 Control: Configure the device to control from a single pixel(3 channels) up to 170 pixels(510 channels) over standard DMX-512. Full frames can be recieved at 40 FPS, partials can be faster.

Serial Control: The DMX(RS-485) interface can be used for serial control of the device at any baud rate and data length, but requires a compatible serial adapter or DMX transmitter that is based on a serial(COM Port) design. Or a standard TTL serial signal, from microcontroller/Arduino can be connected to the RX header and the SN75176 is removed from its socket, then set the desired baud rate using the configuration software. Supports baud rates from 9600 to 1,000,000(1 megabaud). Data packets are framed using an end-of-frame timer, data is framed when there is a 255uS to 32mS(user selectable), space between recieved bytes. Once space is detected it will handle the end of frame functions, any latching will occur, and the firmware will begin waiting for the next packet. Default baud rate is 500,000 actual.

NOTE: WS2812B, WS2811, SK6812, and chipsets with the same protocol will use 500,000 baud for serial control, regardless of the user setting.

Test Mode: Runs through a 7 color+Off(8 states) test pattern. All LEDs change through the 8 states together. Pushes up to 768 pixels. Good for testing a string or looking for dead pixels.

Command Mode: Setting both DIP Switches and power up the controller will enter the device into command mode. The LED should be constant on when starting in Command Mode. Send the configuration bytes at 9600 baud(9600/8-N-1),

DIP Switches		
DIP Switch	1	2
DMX Control	0	0
Serial Control	1	0
Test	0	1
Command	1	1

Supported Pixel I.C. Types:

Name	DMX Pixels	Serial Pixels	Color Bits	Output Data Speed	PWM Speed
WS2811	122	344	8-bit	800Khz	400Hz
WS2812	122	344	8-bit	800Khz	400Hz
WS2812B	122	344	8-bit	800Khz	400Hz
WS2801	170	1024+*	8-bit	2.66MHz SPI	2.5kHz
WS2803	170	1024+*	8-bit	2.66MHz SPI	2.5kHz
LPD8806	170	1280+*	7-bit	8MHz SPI	4kHz
LPD6803	170	1024+*	5-bit	8MHZ SPI	N/A
APA102	170	1024+*	8-bit	8MHz SPI	N/A

*More hasn't been tested but would be supported at lower frame rates

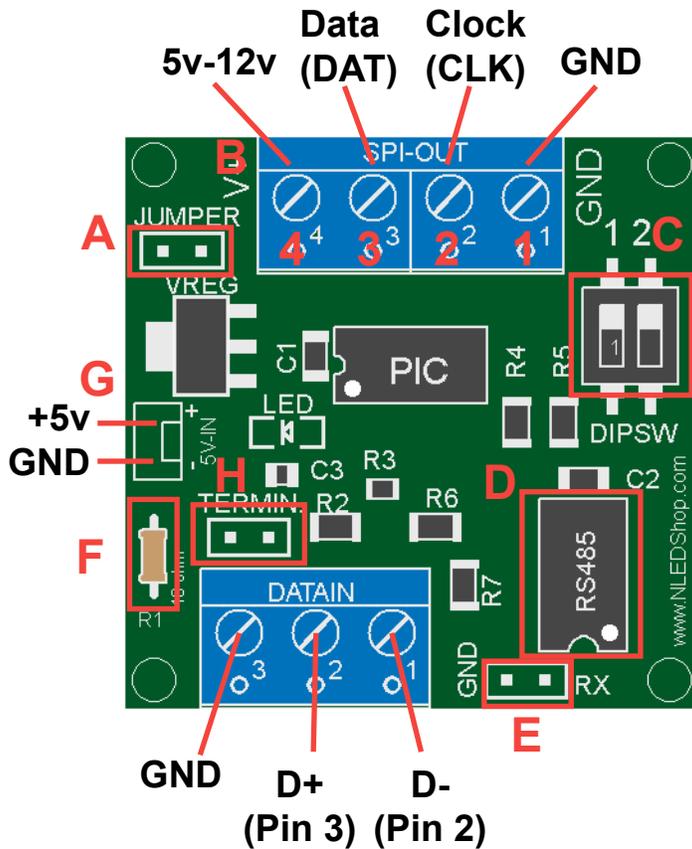
Device Specification:

Input Voltage	3.3v*, 5v**, 7v - 25v***
Current Draw	< 100mA
Input Baud	User Selectable
Connectors	Screw Terminals
Dimension	1.5" x 1.5" x 0.5"

*VREG Jumper Installed, DMX reception is disabled.

**VREG Jumper Installed

***VREG Jumper Left Open



- A:** Jumper, if using 5v input(common usage) jumper must be installed. Connect both holes together.
- B:** LED Pixel Connections, will use some or all of the positions, depending on pixel type.
- C:** DIP Switches for control of options, see table.
- D:** SN75176 RS-485 Transceiver, if using TTL serial input, it should be removed from socket.
- E:** TTL Serial Input Header, RX(RX->TX) and GND
- F:** 10 ohm resistor, acts as fuse in case of bad ground connection or failure. Easy to replace. 1/6w rated.
- G:** 5 Volt Input, optional connection for powering controller separately. Do NOT apply more than 5 volts.
- H:** DMX Termination Header, install jumper if the controller is the only or last device on the DMX chain.

LED Pixel Connections(B)

- 1: Ground
- 2: Clock
- 3: Data
- 4: Voltage Source, 5v - 12v

Most Pinouts Displayed on Bottom Side of PCB

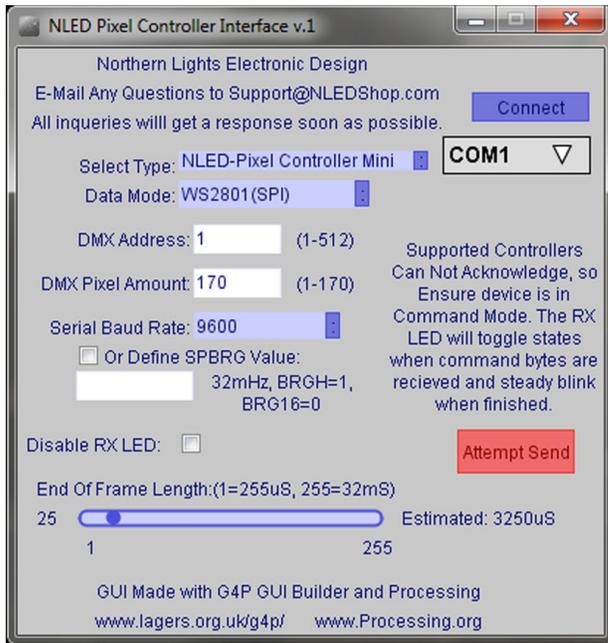
Configuration Software Usage: (See Next Page for More Details)

- With the device powered off, change the DIP switches to Command Mode(Both Set)
 - Option 1: For direct TTL serial
 - Connect a Serial port(or TTL USB Serial such as a FTDI) to GND and RX(Connects to the TX pin of the serial port) headers on the controller
 - Carefully remove the SN75176 IC from the socket, RX Header won't function with it installed. Set it aside some where safe, ESD safe foam is recommended.
 - Option 2: Uses serial over the RS-485 transciever, which is what DMX uses.
 - Connect a TTL Serial Adapter with RS-485 function, any USB serial based DMX transmitter will work, to the DATA IN terminals according to the pinout. Either directly, or through DMX/XLR connector
 - Continue:
 - Power up the device, after first ensuring correct polarity. The LED Indicator should light up and stay on.
 - Start the NLED Pixel Controller Interface Software. Ensure Java is updated, check online.
 - Select the COM port that your serial adapter is on.
 - Click Connect. If successful the button text will change to "Connected". Note it doesn't acknowledge the controller is connected, but that the port was opened successfully.
 - Enter all the configuration information for use with your project. Check the device datasheet for specifics.
 - Click the Attempt Send Button and watch the LED indicator on the device.
 - It should change states(on to off) with each byte received and start blinking steadily when all bytes have been received. Note it doesn't acknowledge or confirm recieved data.
 - Power off the controller.
 - Change the DIP switches to whatever mode is required(serial, DMX or test)
 - Make any connections to your LED strip and data connections.
 - Power the device back on.
- If it does not seem to be functioning correctly, try the process over, if it still doesn't contact support.

Configuration Software(Cont.):

Software Downloaded From:

www.NLEDshop.com/pixelmini



Connect to COM Port, input configuration data, start controller in Command Mode and Press "Attempt Send"

Shown is software version 1c, the newer software version 2a is available for devices with firmware v4, but not required.

Data Mode:

- WS2811/WS2812/WS2812B, 800KHz
- WS2801/WS2803 or other Standard SPI Types
- LPD8806, SPI with MSB set to 1 and latch bytes.
- LPD6803, Modified SPI, 5 bit color packed into 16 bit value
- APA102/APA104, Modified SPI with start and end frames

DMX Address: Starting Address for DMX Reception

DMX Pixel Amount: The amount of pixels to be controlled using DMX-512 input. Can be left at maximum in most circumstances. The amount of pixels to receive in serial control is not constant, data is framed using packet spacing.

Serial Baud Rate: Selected baud rate for use with Serial Control. Should be the same value as the transmitter. For WS2811/WS2812/WS2812B it defaults to 500,000 baud, faster is not possible and slower will alter the maximum amount of pixels that can be controlled. To alter the baud rate for WS2811/12/B pixels from default, input a SPBRG value. See chart below for values. Contact for assistance.

Disable RX LED: Check the box to disable the LED.

End of Frame Length: For Serial Control, defines the time the firmware will wait between bytes to declare end-of-frame. Leave low if possible, but choose a higher value for slower transmissions.

TTL Serial Baud Rate:

The device does not match all common baud rates precisely, due to internal timing. The software lists the common baud rates that a standard serial port will be able to configure to. FTDI and similar serial devices may be able to be set to arbitrary baud rates but, may default to the closest standard value without the user knowing. This chart lists the selected baud rate vs actual baud rate the device is set to.

Closest Common Baud Rate	SPBRG Value	Actual Device Baud	Error %
9,600	207	9,615	0.16%
19,200	103	19,230	0.16%
57,600	34	57,142	-0.79%
115,200	16	117,647	2.12%
230,400	8	222,222	-3.55%
460,800	3	500,000	8.5%
921,600	1	1,000,000	8.5%

The transmitting device should use the Actual Device Baud rate whenever possible. Then the Error % would be 0%.

For Custom User Baud Rates Use This Formula:
 $SPBRG = ((32,000,000 / DesiredBaudRate) / 16) - 1$

Example:

$$SPBRG = ((32,000,000 / 9600) / 16) - 1$$

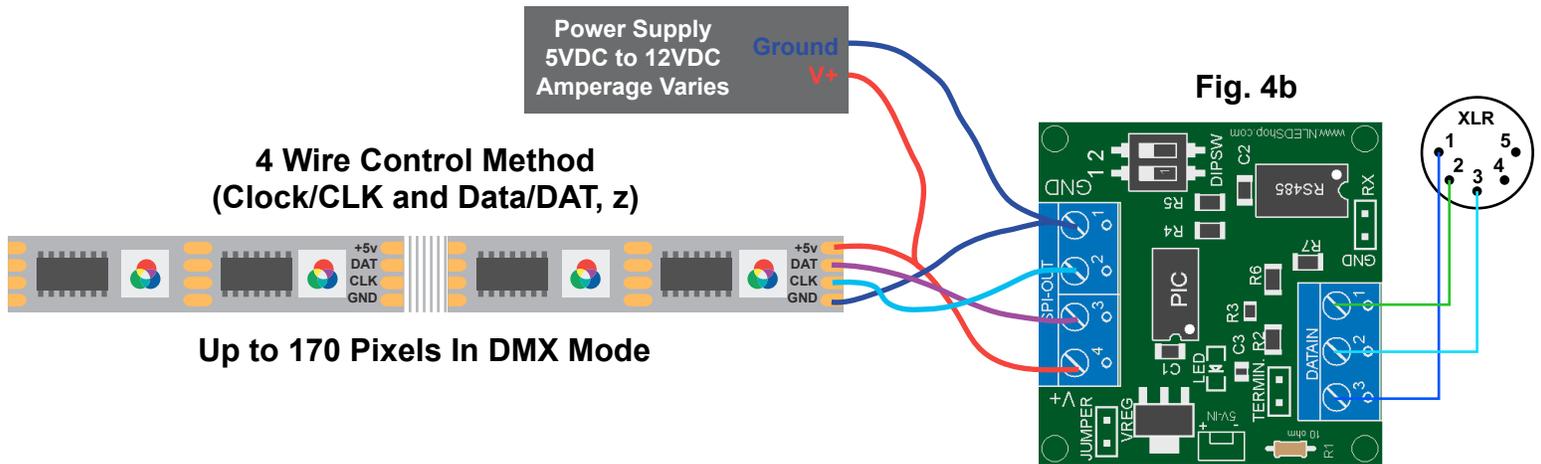
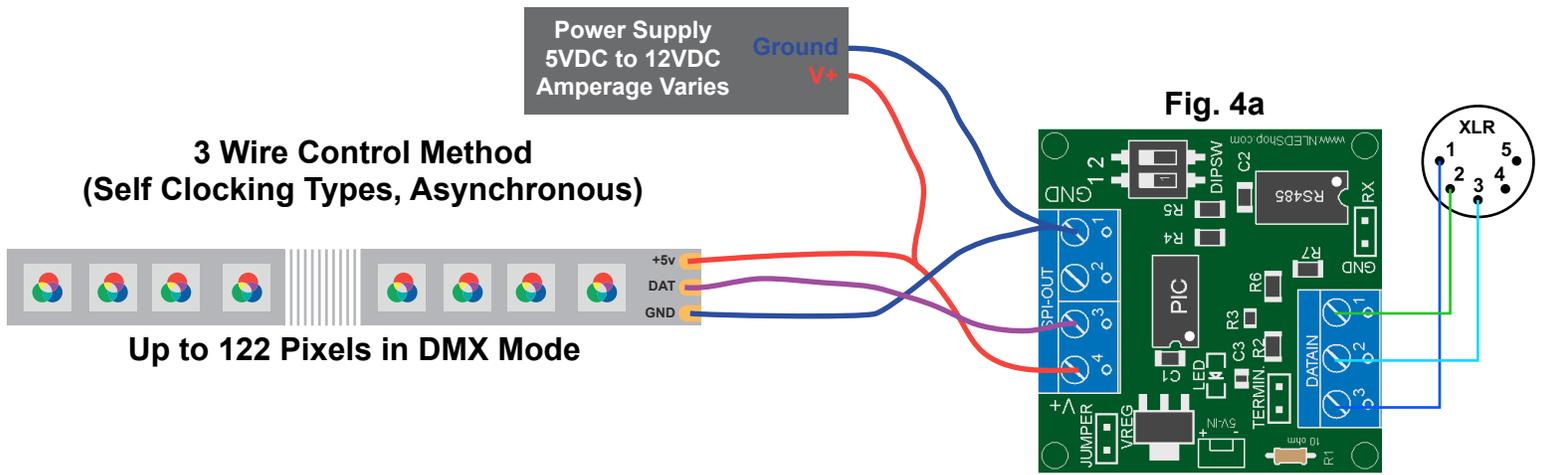
$$32,000,000 / 9600 = 3333.333$$

$$3333.333 / 16 = 208$$

$$208 - 1 = 207$$

Or Contact For Help

LED Pixel Connections



Power Considerations

The controller only draws less than 100mA, the bulk of the current is consumed by the LED pixels. Each pixel can draw on average up to 60mA each at full intensity.

Example:

170 pixels at 60mA each: $170 \times 0.06 = 10.2$ Amps maximum draw.

The standard voltage for LED pixels is 5 volts, but 12 volt types are also available. The JUMPER position on the controller is used for setting up either 5 volt use, which requires installing a jumper wire in the JUMPER position. Or if the controller will operate on an input voltage larger than 5 volts, the JUMPER position is left open.

Setup and Trouble Shooting

Setup:

1. Decide if you will need to install the JUMPER. If your pixel voltage is 5 volts, install the jumper if it is more than 5 volts, commonly 12 volts, DO NOT INSTALL JUMPER, leave open. See previous section.
2. If the pixel chipset and/or any other configurations need to be configured, follow the instructions on page 2 and 3 for details on connecting to software.
3. For testing purposes, it is recommended that TEST mode be ran first as described below before attempting data control.

DMX Usage:

1. Set the DIP switches to DMX mode, 00.
2. If the controller will be the only device on the network, install the jumper on the pin header TERMIN. This terminates the DMX signal preventing interference(reflections)
3. Connect to the DMX network using the 3-position terminal, GND, D+, D- . A 3-pin or 5-pin XLR is commonly used.
4. The device should start receiving the DMX data starting at the configured DMX Address. The notification LED will flash indicating the controller is receiving valid DMX data. The flash speed indicates packet rate.

Serial Control Usage:

1. Set the DIP switches to SERIAL mode, 10.
2. If using direct TTL control, remove the 8-pin transceiver(SN75176) and connect the transmitting serial device to RX and GND positions on the edge of the controller.
2. If using differential(RS485) serial transmitter, connect it to the DATAIN terminal via GND, D-, D+
3. Power up the controller.
4. Start transmission from transmitting serial device, at the previously configured baud rate(19200 default)
5. The notification LED will blink indicating it has latched a data packet.

Testing The Controller and Chipset Configuration:

1. Disconnect Power.
2. Set DIP Switches to TEST Mode, 01
3. Connect Power.
4. Notification LED should blink slowly. At about 2hz.
5. If it does not ensure the controller is getting suitable power as and JUMPER has been configured.
6. Connect the pixel strand
 - a. If it blinks/strobes erratically it may either DAT and CLK are swapped, or the chipset is not configured does not match the chipset that is connected.
 - b. If the pixels do nothing or light up but do not respond, try same as above.
7. If the LED pixels blink a steady and solid, Red-Yellow-Green-Teal-Blue-Purple-White-Off pattern, then the controller is configured correctly and is ready to use in one of the data modes. (above)