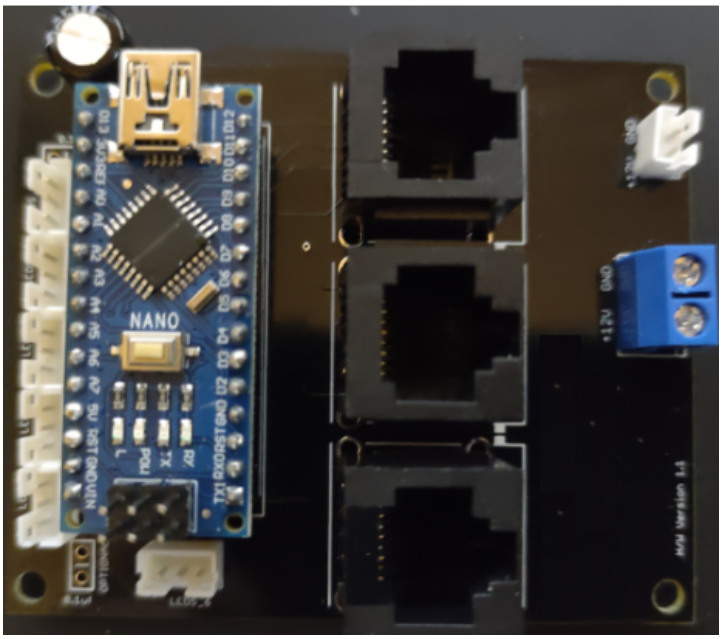
EVOLUTION MODS

presents

the PINNUNCIATOR

with *Light-Show Studio Software*

INSTRUCTION MANUAL



Last Updated: March 10th, 2024

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DISCLAIMER

This product has been tested and is believed to function properly and safely as described in the instruction manual. We recommend testing outside of any original equipment before installing. It is critical that wiring proper voltage, polarity, and device specifications are considered before installing this device into your equipment. If you are not sure about any specific detail of your implementation of this product, please consult with an electronics expert. Evolution Mods LLC will not be held liable for any damage caused by installing our products. It is expected that you test this product for your purposes and install it if it meets your needs. To completely isolate this product from your equipment, you have the option of using an isolated power supply and photoresistor I/O boards, which provide integration with no physical electrical contact (this is the safest way of implementing this device.)

When doing electronics projects like this, it is possible to make a mistake and cause damage to the Pinnunciator board. In our experience, when this happens, it is most likely the Arduino Nano device that is damaged when things are hooked up wrong. We do not warranty the Arduino Nano, but the good news is that they are very inexpensive on eBay and even less expensive on AliExpress. You can replace your Arduino Nano yourself, but pay special attention to the orientation and ensure that all pins are lined up properly or you will cause damage to the replacement Arduino Nano.

The Pinnunciator board requires +12VDC power. It is critical that the 12V power source does not exceed about 12.1VDC. You should keep it as close to 12.0V as possible. Some cheaper power supplies say 12V, but output 12.3 or higher. 12.3V is way too high for proper Arduino Nano functionality.

If you damage your Arduino Nano board, you will need to purchase a new one.

INTRODUCTION

The Pinnunciator is an advanced modular LED controller for triggering and displaying custom light-shows and servo motors. Although the Pinnunciator can be integrated with many commercial devices, it was originally designed for the purpose of adding enhanced light-shows and motors to commercial pinball machines.

A fully-loaded Pinnunciator system would have the following capabilities:

- 6 output channels can support the following devices:
    - WS2811 or WS2815 individually addressable RGB LED strips.
    - PWM (Pulse Width Modulation) for Servo Motors or any other PWM devices.
    - Ports for output channels 1, 2, and 3 are on each I/O board for remote placement of devices.
- 9 input ports (3 on each I/O board.) Depending on the I/O board used, input voltages between 2.7 VDC and 60 VDC are supported. Triggers can be switches, LEDs, coils, light sensors or any other digital electrical signal.
- 3 digital output channels can be used to trigger higher-power devices such as coils, motors, beacons, or other devices. Devices can consume up to 50 VDC and several amps of current.

NOTE: This device will also support some 5V LED strips, but a separate 5V power source would be required for those. 5V LED strips should not be connected directly to the 12V power from the 6 output channels. Also, keep in mind that while servo motors can be controlled via the 6 output channels, they are typically powered by 5V and should also be powered with an external 5V power supply. A Servo/PWM I/O board is available, making connecting a servo motor to the Pinnunciator seamless.

The biggest advantage of using the Pinnunciator to design your own custom light-shows is the advanced software that eliminates any need for custom coding. Your light shows can easily be customized and designed in an intuitive user interface. You can make your light-shows as simple or complex as you like, using intricate timers and multiple inputs for triggering them. What would normally take days or even weeks to develop and test will only take minutes.

THE HARDWARE

The hardware consists of the main Pinnunciator board and I/O boards interconnected via standard RJ45 CAT6 cables. The Pinnunciator board requires +12VDC power. It is critical that the 12V power source does not exceed about 12.1VDC. Some cheaper power supplies say 12V, but output 12.3V or higher. You should keep it as close to 12.0V as possible. 12.3V is way too high for proper Arduino Nano functionality.

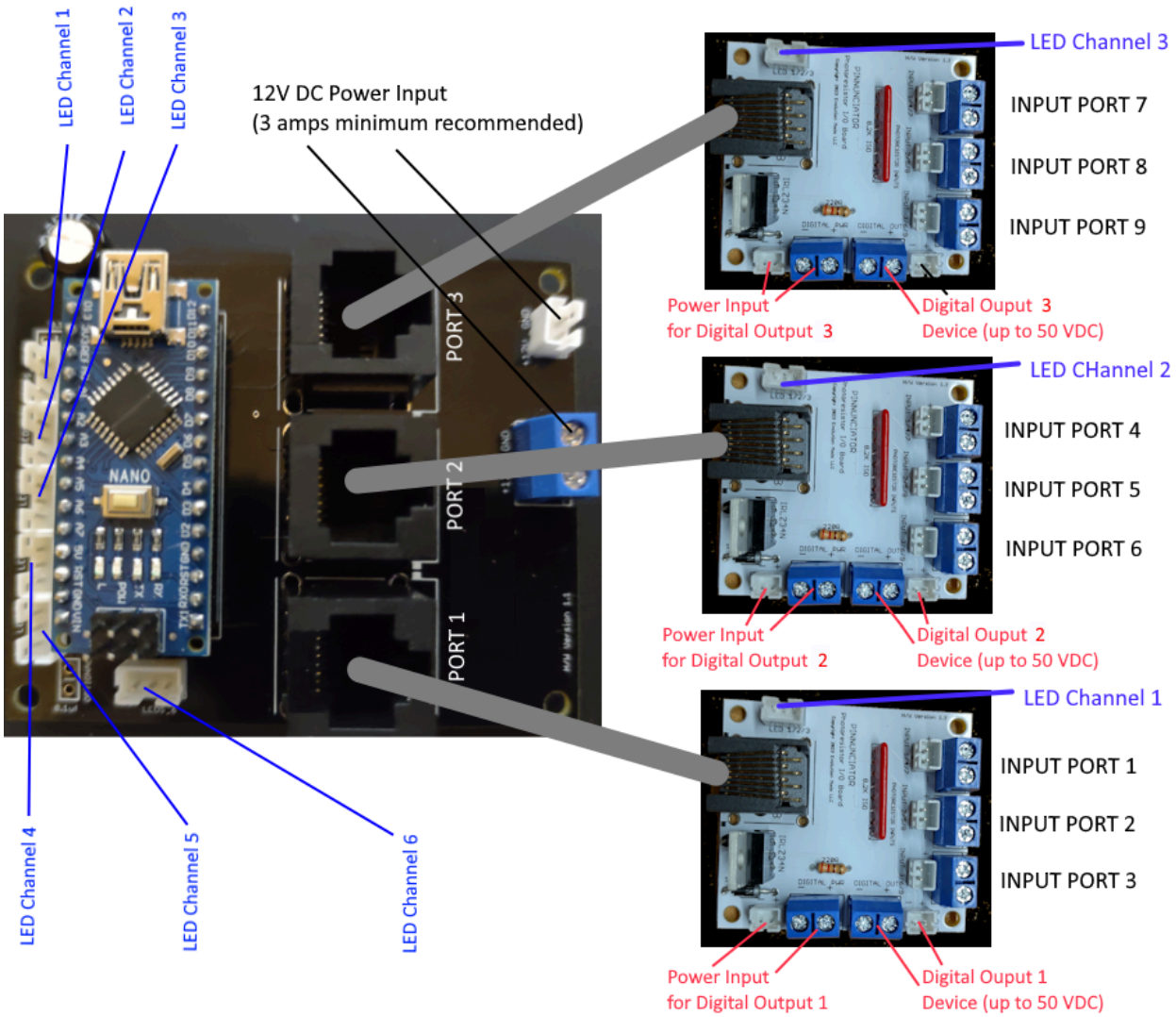
The main Pinnunciator board has 6 ports for LED channels, 3 RJ45 ports for I/O boards, and 1 low voltage input port (2.7VDC to 5.1VDC). The RJ45 ports allow you to place your I/O boards in any remote location via RJ45 network cables. Each I/O board can support up to 3 inputs.

There are 4 types of I/O boards that can be used:

- **Photoresistor/Switch I/O Board -**
    - For connecting isolated switches directly to the input terminals.
    - For using 10K Ohm (recommended) photoresistors to trigger light-show effects with a light source.
- **High Voltage I/O Board (Common Ground) -** For using an electrical signal to trigger light-show effects. The electrical signal can be anywhere from 4.7 VDC to 60 volts DC to reliably trigger the input trigger. This board is great for using any high voltage signal that has a common ground as an input. (dimmable LEDs are not tested or recommended) Most coils have an isolated ground (or are triggered at the ground side of the circuit), so this board will probably not work properly for coils.
- **High Voltage I/O Board (Isolated Ground) - Great for most pinball coils** - For using an electrical signal to trigger light-show effects. The electrical signal can be anywhere from 2 VDC to 60 volts DC to reliably trigger the input trigger. This board is great for using any high voltage signal that has an isolated ground as an input. (dimmable LEDs are not tested or recommended) Most coils have an isolated ground (or are triggered at the ground side of the circuit), so this board will work great for most coils.
- **Low Voltage I/O Board (Common Ground) -** For using lower voltage signals to trigger light-show effects. Switches typically use lower voltage signals. The electrical signal applied to the inputs of this board should not exceed about 5 VDC. This board is for devices that have a common ground. For devices that have

an isolated ground, use the High-Voltage I/O Board (Isolated Ground). It can support very low voltages also.

I/O boards can be connected to the main board via a standard RJ45 CAT6 cable. CAT5 will work, but we recommend CAT6 because it uses thicker wire. With properly selected RJ45 cable lengths, you can place the I/O boards and main Pinnunciator controller board in any location you desire as it makes sense. This will reduce cabling requirements, simplify installation, and increase reliability.



Depending on which port the I/O board is plugged into, the inputs and digital output will be numbered differently. For example, if you plug an I/O board into PORT 1, the 3 inputs will be 1, 2, and 3 and the digital output will be Digital Output 1. If the same board is plugged into PORT 2, the 3 inputs will be 4, 5, and 6 and the digital output will be Digital Output 2.

The Pinnunciator power can be provided via a 2 pin 2.0mm JST cable or by connecting wires to screw terminals. The same goes for the input ports and digital outputs on the I/O board; either screw terminals or 2.0mm 2-pin JST ports can be used as desired.

I/O Boards

All 3 I/O board types have the same basic design. The *only difference* is that the type of device that can be connected to the 3 INPUT ports. The different I/O boards listed above can support electrical signals of various voltages, isolated switches (switches not connected to any wiring in your equipment), or photoresistors (light-sensors).

There is a 2-pin JST connector labeled *Power* on each I/O board type. This provides +12V that you can use that comes from the main Pinnunciator board. You can use this connector to power an *always-on device* or route it to the digital power input to allow you to control the device with your Light-Show Studio configuration, assuming the device requires 12V of power. You could also route this power connector to the digital output power input with no need for power from another source. We recommend keeping the current below about 2 amps if using the 12V power from the I/O board.

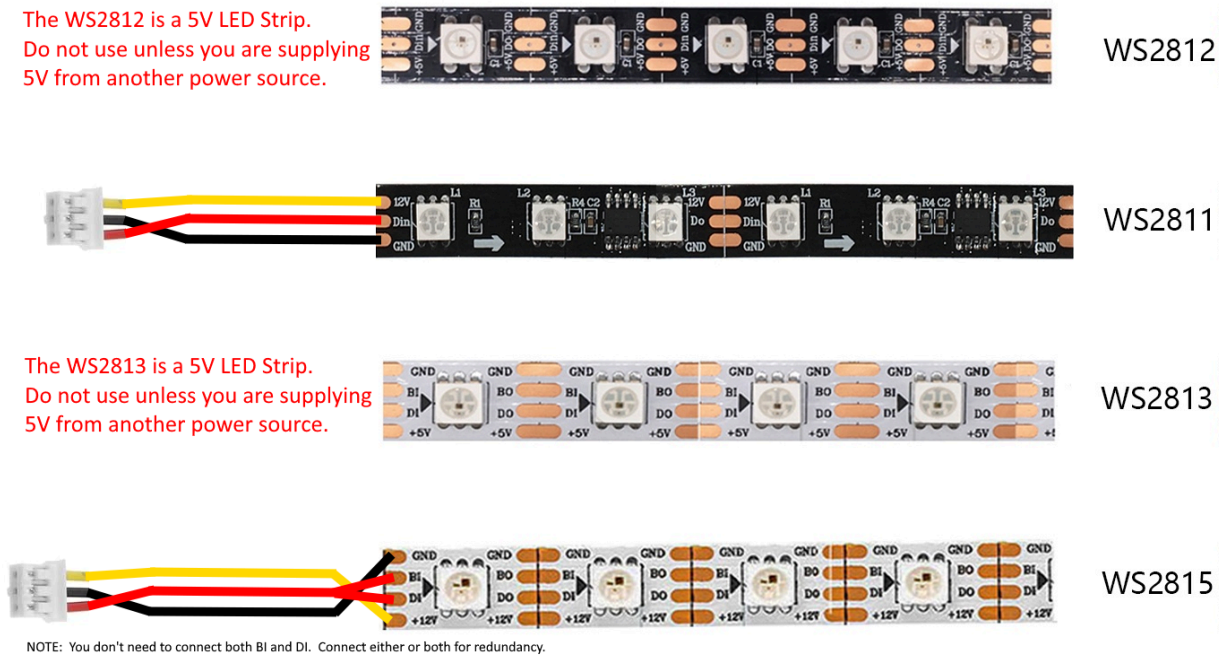
For low voltage and high voltage input signal I/O boards, be aware of the input voltage and polarity (which connection is positive and ground.) Double-check polarity and voltage on the device you are connecting to with a multimeter. For most coils, be sure to use the isolated ground version of the I/O board or you will see incorrect inputs fire when the coil fires.

For the light-sensing photoresistor and switch I/O boards, you can connect either photoresistors or isolated switches (switches not connected to any of your equipment's circuitry). Polarity doesn't matter. You can run wires from the + and - terminals to the desired location. We recommend 10k ohm photoresistors. Any isolated on/off switch can also be connected directly without any additional hardware.

Either the JST connector port or the screw terminals can be used for each input.

WS2811 LED WIRING

WS2811 compatible LEDs are readily available and sold in the online store at https://www.evolutionmodsllc.com.



Take special note of the arrows printed on the strip. The arrows must be pointing away from the connector as shown above.

With WS2811 LEDs, there are 3 LEDs per controller chip. Therefore, every 3 LEDs will count as one segment that can be controlled individually by the Light Show Studio software.

If you need to control each and every LED individually, you'll want to acquire WS2815 LED strips. These are 12V and will work the same as WS2811 except for slightly different wiring.

You can purchase pre-crimped JST cables and solder them to LED strips by following the above diagram. You can also daisy-chain the strips together. Using the above standard cable colors, yellow is +12V, black is ground, and red is the data wire. It is critical that these connections are made properly or you will damage your Arduino Nano. Be sure to test outside of your equipment first.

WS2811 LEDs can come in multiple configurations that may not be clear when purchasing. They may be RGB, GRB, or BRG. If the wrong type is used, the colors displayed on the LED strips will be different from the colors you select in the software. Fortunately, the Light-Show Studio software will allow you to select the proper RGB orientation to ensure your colors are correct. You can mix and match RGB with GRB, but the LED strips with different orientations must be placed on different LED Channels on the Pinnunciator board.

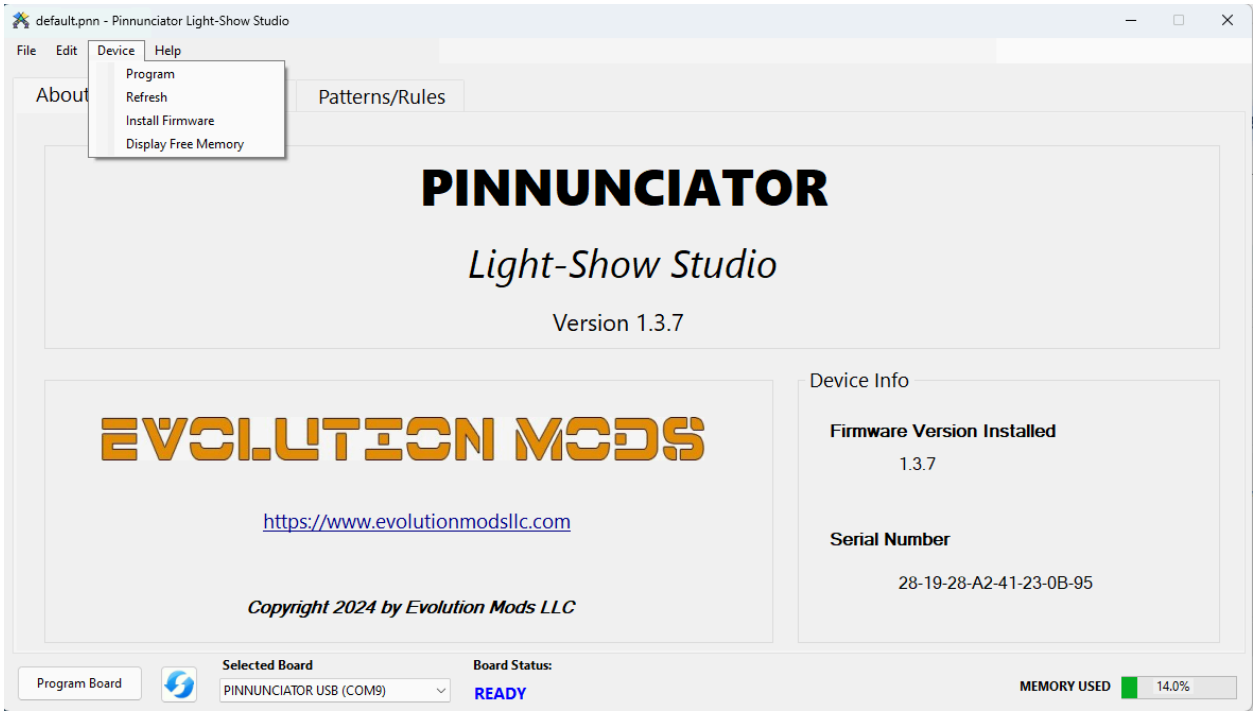
LIGHT-SHOW STUDIO SOFTWARE

The Light-Show Studio software allows you to customize and configure just about any patterns and rules you can think of without the need to write a single line of code. You can monitor any combination of inputs to trigger any number of rule effects on one or more LED channels. You can also have different effects running simultaneously on different LED channels due to the multi-threaded architecture of this device.

Connect the Pinnunciator board to your computer using a USB-C cable and launch the software. Keep an eye on the *Board Status* indicator at the bottom of the window. If the board status says READY, the board is ready to program. If it says FIRMWARE MISSING, you will likely need to update the firmware. You will also need to update the firmware if your Light Show Studio version is newer than the displayed Firmware Version.

If you plug the board in after launching the software, press the  button to tell the software to try to find the board again.

Updating Firmware



Firmware for the Pinnunciator board is included with each version of Light Show Studio. The firmware on your board must be the same version as the version of Light Show Studio you are running.

To update the firmware on your Pinnunciator device, select *Install Firmware* from the System dropdown menu.

- To perform a firmware update, your computer must have access to the Internet. This is the only function of the Pinnunciator that requires Internet access. Once the firmware is updated, all other functions can be performed offline.
- Firmware updates cannot be done wirelessly and requires that the board be plugged in via a USB cable.
- The HC06 Bluetooth module and USB will not work simultaneously. With the power off, unplug the bluetooth module before attempting to update firmware.

After clicking Install, the firmware update will begin immediately. The firmware update should not take more than a minute to complete. The EEPROM will be erased, so make sure you have any Light Show Studio configuration saved prior to updating the firmware.

BOARD STATUSES

READY - The board has successfully initialized and is ready to be programmed.

NOT FOUND - The software cannot find the board. Ensure it is plugged into your computer and try a different USB cable. Press the  button to tell the software to try to find your board again.

PLEASE RE-INSTALL FIRMARE - More than likely, this means the firmware installed is incompatible and the latest firmware needs to be installed. Be sure to get the latest version of the Pinnunciator Light Show Studio software from https://www.evolutionmodsllc.com

COMMUNICATIONS ERROR - This means the software is having difficulty communicating with the Pinnunciator board. Maybe something else is conflicting with serial communications to the Pinnunciator board.

COMMUNICATIONS ERROR - TIMEOUT - This means the software is waiting for a response from the Pinnunciator board, but it has taken too long. This could mean the firmware is missing. You can try re-installing the firmware.

PROGRAMMING…. - The device is being programmed with the configuration currently loaded. This should always take less than 2 seconds.

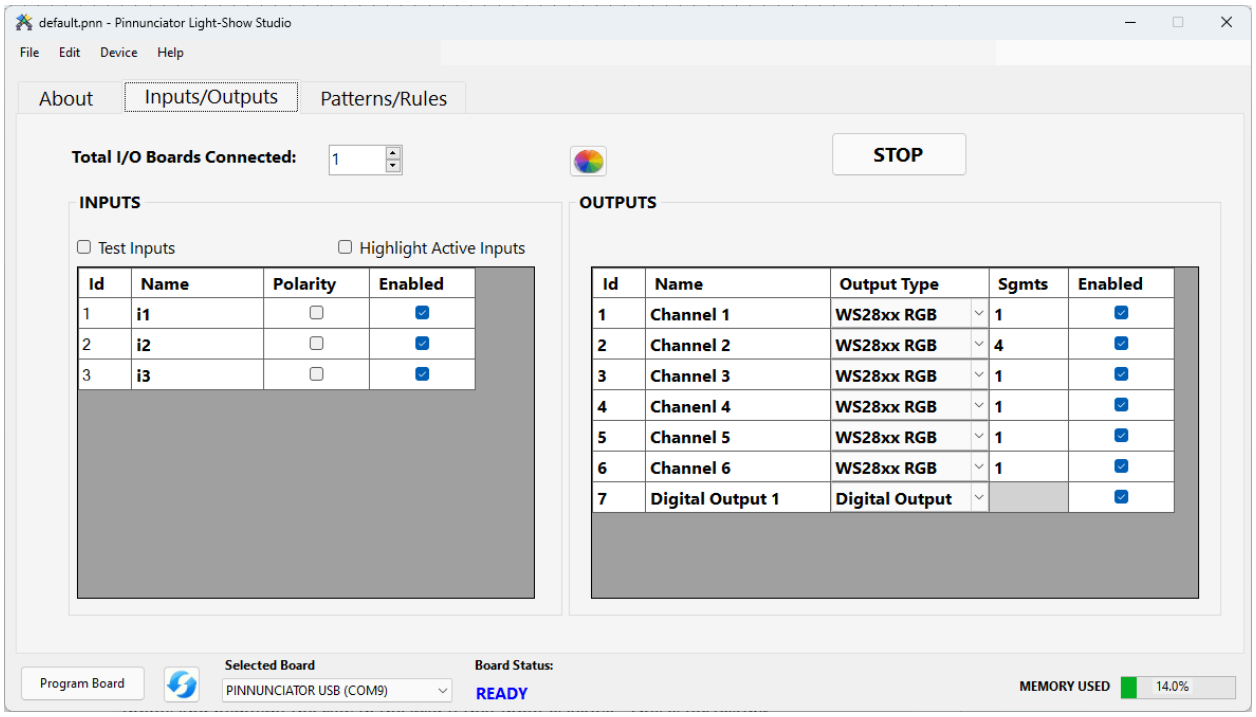
PROGRAMMED SUCCESSFULLY. - The device has been programmed and is ready to be tested and used.

INPUT AND OUTPUT CONFIGURATION

Select the Inputs/Outputs tab.

Light-Show studio will start you out with a default config that includes default color palette, input, and output settings.

Total I/O Boards Connected: The number of I/O boards you have will determine the number of inputs and digital outputs you have available. Set the Total I/O boards Connected value to the number of I/O boards you will be using. If you do not have any I/O boards and set this value to 0, you will only have one low voltage input available that is located on the Pinnunciator board.



INPUTS

By clicking in the grid, you can change the values for the inputs.

Highlight Active Inputs: If this checkbox is checked, the software will monitor the inputs and highlight the row in the grid if that input is active. This is for testing purposes.

Name: You can change the names of your inputs to names that make sense to you.

Polarity: If you check the polarity checkbox, the input will behave in reverse. (Off is On and On is Off). You would use this if you want the input to register as On and turn off when it is triggered.

Enabled: If you don't want an input trigger to register, you can disable it by deselecting this checkbox.

Test Inputs: Select the Test Inputs checkbox to enable test mode. A new column will appear in the grid called *Test*.

Test: These checkboxes will artificially enable one or more inputs for testing purposes. You can check multiple inputs to confirm whether they properly activate a rule.

OUTPUTS

By clicking in the grid, you can change the values for the outputs.

Name: You can change the names of your inputs to names that make sense to you.

Output Type:

LED Output Channels

This is where you can specify the type of device you are connecting to the specified output. Currently, WS2811 and WS2815 LED strips are supported. Other WS28xx LED strips will work if you supply them with 5V instead of 12V. You will need to specify whether the strips you are using for each channel are RGB, GRB, or BRG. If the colors display wrong, you will likely need a different LED type setting.

Segments: Specify the physical number of individual segments that the connected LED strip for this channel. For WS2811 strips, typically there will be 3 LEDs per controller chip. So a 9 LED strip would have 3 segments. For WS2815, there will be 1 LED per controller chip. The important thing to note is that this value should specify the number of individually addressable segments for that strip.

PWM Output Channels

You can designate an output channel for PWM control. This is for connecting a servo motor, or other devices that abide by the PWM specification. Keep in mind that most

servo motors use 5V and the LED output power is 12V. You can use the ground and data lines for your servo motors, but you must supply 5V to the servo motor with a separate power supply.

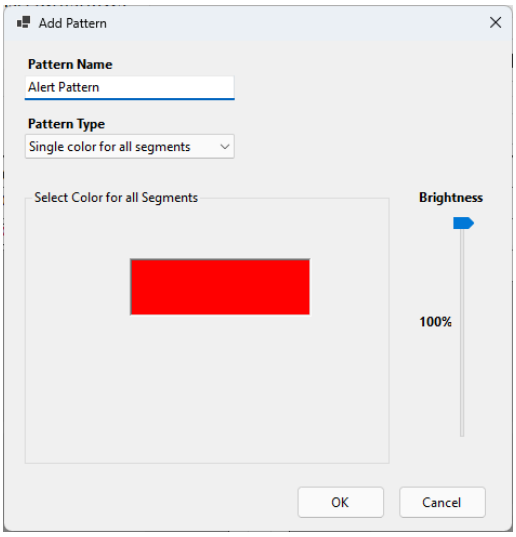
Enabled: If you want to disable a particular output, you can do so by deselecting this checkbox.

PATTERNS/RULES CONFIGURATION

PATTERNS

A pattern stores colors into patterns that can be easily applied to LED strips with rules.

Click on the Add Pattern button to add your first pattern.



Give your pattern a name that will make it easy to recognize. Patterns are sorted in alphabetical or numeric order on the pattern list, so you may want to consider this when determining pattern names.

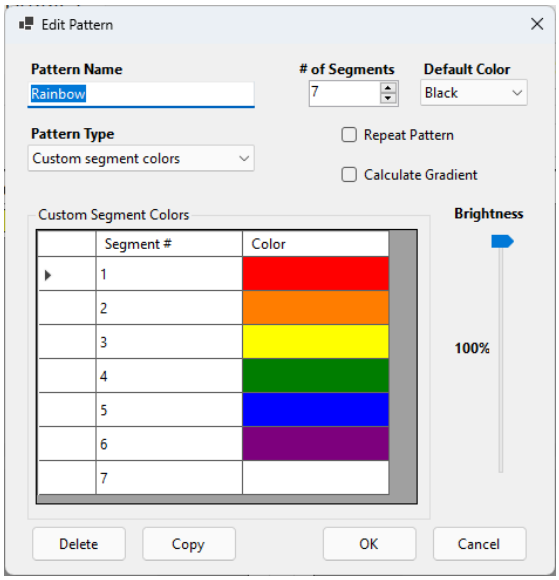
There are two options available for pattern type:

- **Single Color for All Segments** - applies the color you select to all segments of an LED strip. This is a great option to select if you want all LEDs on the LED strip to be the same color because it requires hardly any EEPROM space to store.

  Click on the single color displayed to bring up the color palette selector dialog.

- **Custom Segment Colors** - allows you to specify a different color for each segment of an LED strip. The number of segments can be less than or more than the physical strip segment depending on which effect you are using for the pattern.

# of Segments: First set the number of segments for your pattern. Then, you can click on any of the segment colors you have added to bring up the color palette selector dialog.



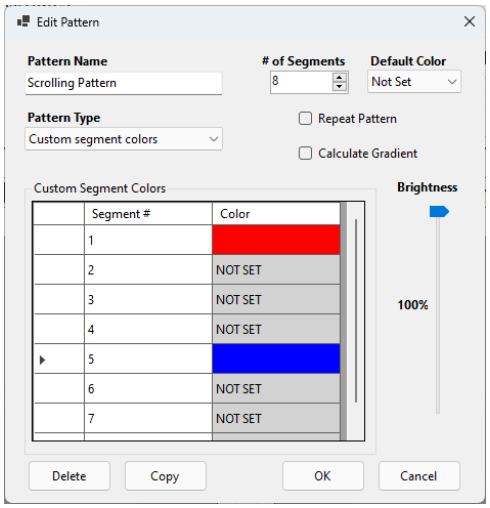
Default Color allows you to specify whether you want the default color to be NOT SET or Black when adding new segments. This will be particularly handy as you will learn in the *Gradient Effect* section.

Repeat Pattern checkbox will repeat the pattern you have configured to encompass the entire LED strip. For example, if you had a 14 segment LED strip, but only configured 7 segments above, but you checked the Repeat Pattern checkbox, the rainbow effect would display twice on your LED strip.

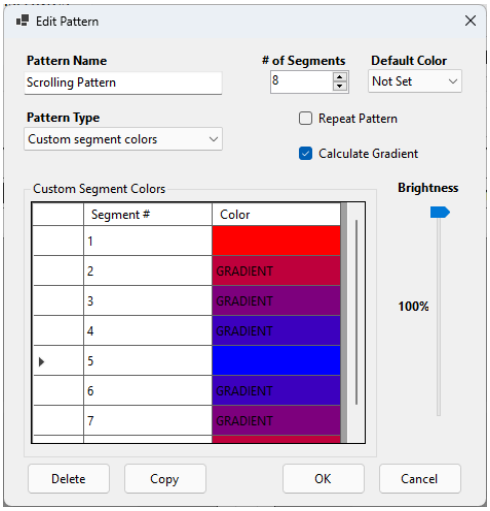
Brightness slider allows you to increase or decrease the brightness of all segments of the pattern. Full brightness capable of the LED is 100%. 0% will render completely blank LEDs.

Calculate Gradient: Gradient LEDs are a series of LEDs that can change colors smoothly, like a sunset transitioning from orange to pink. These LEDs use special technology to blend different colors together, creating a beautiful and gradual color change. They're often used in things like mood lighting, decoration, or even in some fancy displays to create eye-catching effects. So, think of them as lights that can smoothly shift from one color to another, creating a soothing or visually appealing experience.

To create a gradient pattern, simply create a pattern with multiple colors separated by *NOT SET* segments.

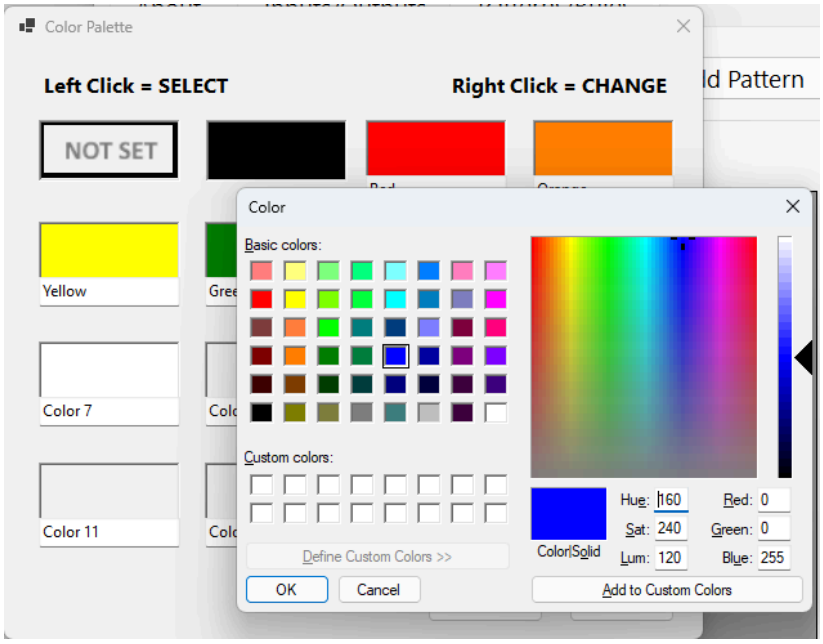


Now check the *Calculate Gradient* checkbox.



The NOT SET colors in-between the colors you have selected have been automatically calculated for you. Although you may apply these patterns to any of the available effects, gradient patterns are especially suitable for scrolling effects. You can use any number of colors and segment positions to make up your gradient effect.

In addition to NOT SET and Black (Black means LED is off), you can define up to 14 custom colors and change the names for each color.



LEFT CLICK a color to change it to your own custom color.

RIGHT CLICK a color to select that color to be added to your pattern.

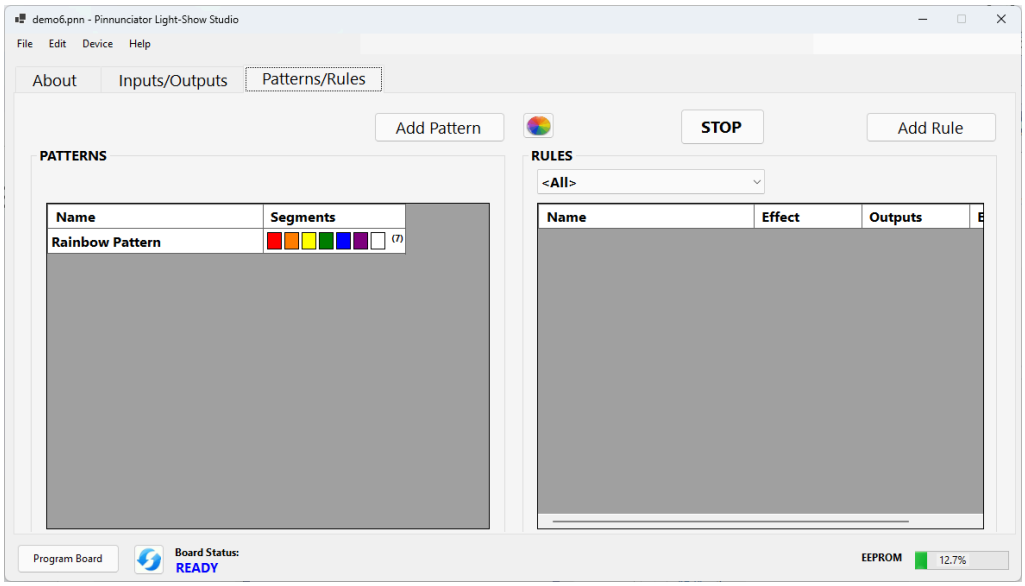
NOT SET and **BLACK** are default colors that cannot be modified. Select **NOT SET** if you do not want the designated segment to be updated. This is a great feature if you have two Rules updating the same LED strip and you want certain segments to be left alone. **BLACK** means that segment will be turned off.

Once you click OK on the Edit Pattern dialog to save your pattern, you will see your new pattern on the Pattern List. It will also display the colors and number of segments defined by each pattern.

To edit the pattern, you have created, simply click on it with the left mouse button.

To copy a pattern, select the Copy button on the Edit Pattern dialog. Once you confirm you want to make a copy, you will be able to set a new name for the pattern, make any needed changes, and save your new copied pattern.

To delete a pattern, click on the Delete button. You can only delete patterns that are not in use by an existing Rule.



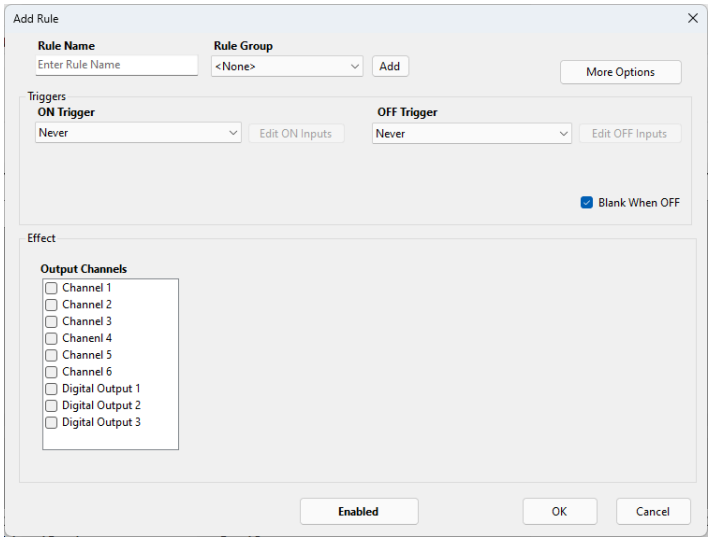
Now that we have a pattern created, we can create a rule to utilize it.

RULES

A rule allows you to apply one or more patterns to one or more LED channels using a particular effect. The rule can be triggered based on an input changing, a timer, when the board is powered-on, or after another rule ends.

Rules are multi-threaded, meaning you can run multiple rules simultaneously. You can even set up multiple rules to apply to a single LED strip. This allows some very complex behaviors and light-shows.

Click the Add Rule button to add a new rule.



Rule Name: Set a rule name that makes sense for what the rule does. Keep in mind that rule names are sorted in alphabetical or numeric order on this list.

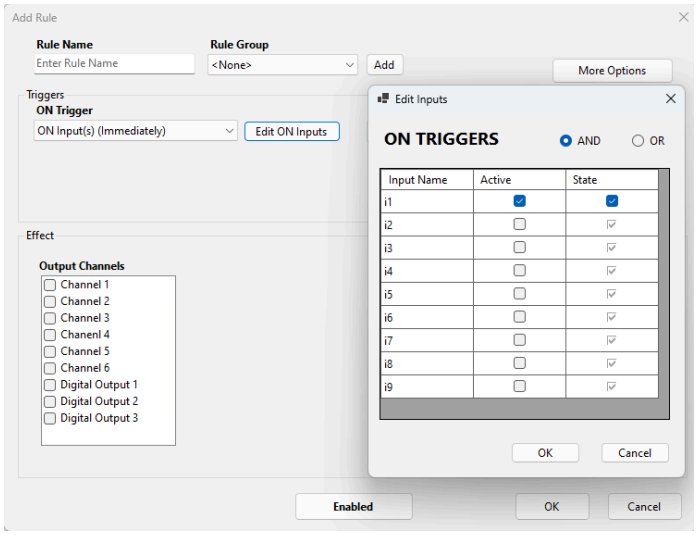
Role Group: If you create many Rules, you may want to group them together as they may be used in conjunction with each other for a specific purpose. Click the Add button and enter a name for your Role group. Once you create a Role Group, you will be able to set new or existing Rules to also be a part of that group by selecting from the Rule Group dropdown menu.

ON Trigger: The ON Trigger determines when the rule will be turned on.

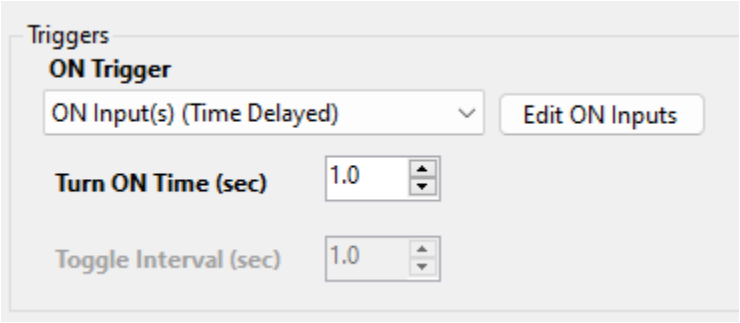
- **Never:** Rule will never be turned on.
- **When Powered On:** Rule will be turned on when the board is powered on
- **Based on ON Input(s) (Immediately):**
    - If OR is selected, Rule will be turned on immediately when any one of the

selected ON inputs are triggered.

- If AND is selected, Rule will be turned on immediately when all of the selected ON inputs are triggered.



- **Based on ON Input(s)(Time Delayed):**
  - If OR is selected, Rule will be turned on after a specified amount of time after any one of the selected ON inputs are triggered.
  - If AND is selected, Rule will be turned on after a specified amount of time after all of the selected ON inputs are triggered.



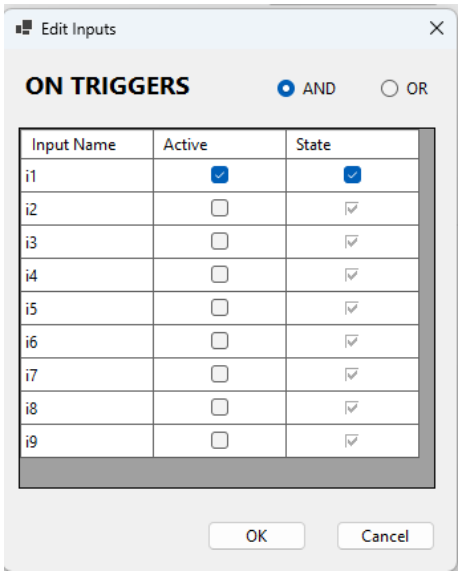
- **Based on ON Input(s) (Stable):**
  - If OR is selected, Rule will be turned on after any one of the selected ON inputs have been triggered and are stable for a specified amount of time (specified in seconds.)
  - If AND is selected, Rule will be turned on when all of the selected ON inputs have been triggered and are stable for a specified amount of time (specified in seconds.)

- **Based on ON Input(s) (Stable Toggle):** This trigger is the same as *ON Input(s) (Stable)* except it will only trigger when the input has been toggling faster than the time specified in the *Toggle Interval* box (specified in seconds) for the entire duration of the *Turn On Time*. It will also trigger if the input has been ON for the entire duration of the *Turn On Time*.
- **When another rule starts:** Rule will be turned ON immediately after another rule starts. You can activate a rule when multiple other rules end if desired. Select one or more rules you want to use to activate this rule.
- **When another rule ends:** Rule will be turned ON immediately after another rule ends. You can activate a rule when multiple other rules end if desired. Select one or more rules you want to use to activate this rule.

OFF Trigger: The OFF Trigger determines when the rule will be turned off.

- **Never:** If the rule is triggered, leave it running indefinitely.
- **Based on ON Input(s)(Immediately):** Rule will be turned off immediately when any of the selected ON inputs are deactivated.
- **Based on ON Input(s) (Time Delayed):**
    - If OR is selected, Rule will be turned off after a specified amount of time after any one of the selected ON inputs are deactivated.
    - If AND is selected, Rule will be turned off after a specified amount of time after all the selected ON inputs are deactivated.
- **Based on ON Input(s) (Stable):**
    - If OR is selected, Rule will be turned off after any of the selected ON inputs have been deactivated and are stable for a specified amount of time.
    - If AND is selected, Rule will be turned off after all of the selected ON inputs have been deactivated and are stable for a specified amount of time.
- **Based on ON Input(s) (Stable Toggle):** This trigger is the same as *ON Input(s) (Stable)* except it will only trigger when the input has **NOT** been toggling faster than the time specified in the *Toggle Interval* box (specified in seconds) for the entire duration of the *Turn Off Time*. It will also trigger if the input has been OFF for the entire duration of the *Turn Off Time*.
- **Based on OFF Input(s) (Immediately):** *This allows you to use some alternative input trigger(s) to turn off the rule.*
    - If OR is selected, Rule will be turned off immediately when any of the selected OFF inputs are deactivated.
    - If AND is selected, Rule will be turned off immediately when all of the selected OFF inputs are deactivated.

- **Based on OFF Input(s) (Time Delayed):** *This allows you to use some alternative input(s) to turn off the rule.*
    - If OR is selected, Rule will be turned off after a specified amount of time when any of the selected OFF inputs are deactivated.
    - If AND is selected, Rule will be turned off after a specified amount of time when all of the selected OFF inputs are deactivated.
- **Based on OFF Input(s) (Stable):** *This allows you to use some alternative input to turn off the rule.*
    - If OR is selected, Rule will be turned off after any of the selected OFF inputs have been deactivated and are stable for a specified amount of time.
    - If AND is selected, Rule will be turned off after all of the selected OFF inputs have been deactivated and are stable for a specified amount of time.
- **Based on OFF Input(s) (Stable Toggle):** This trigger is the same as *OFF Input(s) (Stable)* except it will only trigger when the input has been toggling faster than the time specified in the *Toggle Interval* box (specified in seconds).
- **Time Delayed:** Rule will be turned off after a specified amount of time.
- **When another rule starts:** Rule will be turned OFF immediately after another rule starts. You can deactivate a rule when multiple other rules end if desired. Select one or more rules you want to use to deactivate this rule.
- **When another rule ends:** Rule will be turned OFF immediately after another rule ends. You can deactivate a rule when multiple other rules end if desired. Select one or more rules you want to use to deactivate this rule.



Editing Inputs: To select the inputs that will be monitored for turning your rule on and

off, you will need to select the inputs by clicking the *Edit On Inputs* or *Edit Off inputs* button. The AND and OR options have been explained above, but there are two columns of checkboxes, *Active* and *State*.

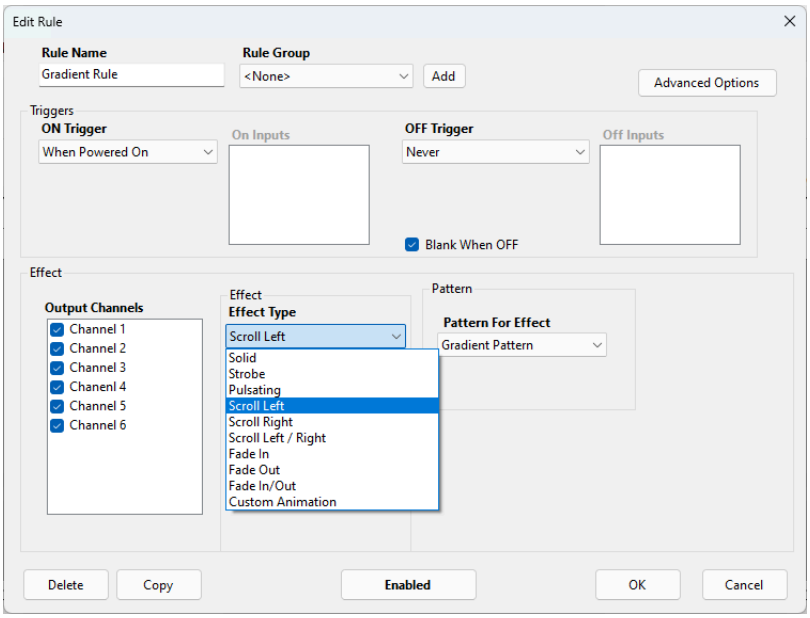
- **Active** - Check this checkbox to specify that this input should be monitored for turning this rule on or off.
- **State -** Check this checkbox to specify what state the input needs to be in to cause the rule to turn on or off. This allows you to monitor inputs that are either on or off. For example, you may want to ensure that an LED is off for at least 3 seconds before turning this rule on.

Blank When Off:

- **For LEDs:** If checked, all LED segments that this rule controls will be turned off when the rule is no longer active. If unchecked, the rule will leave the last pattern displayed until it is cleared or changed by this rule or another rule.

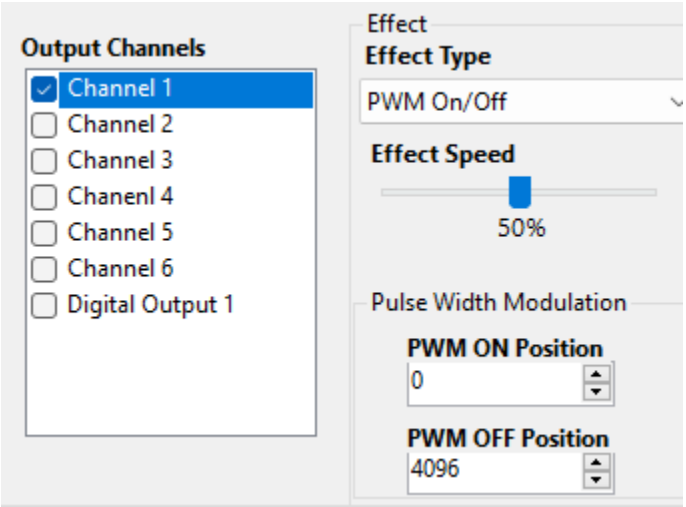
Effect: This section determines which effect this rule will generate.

Output Channels: The Output Channels list determines which output channel(s) this rule will apply to.



PWM Outputs: PWM stands for Pulse Width Modulation. It is used for controlling servo motors and other similar devices. If an output channel is designated for PWM on the Inputs/Outputs tab, you will see these options when selecting the PWM-designated output

channel:



PWM ON Position - Specifies the PWM position to send to the servo motor (or other device) when the Rule is activated.

PWM OFF Position - Specifies the PWM position to send to the servo motor (or other device) when the Rule is deactivated.

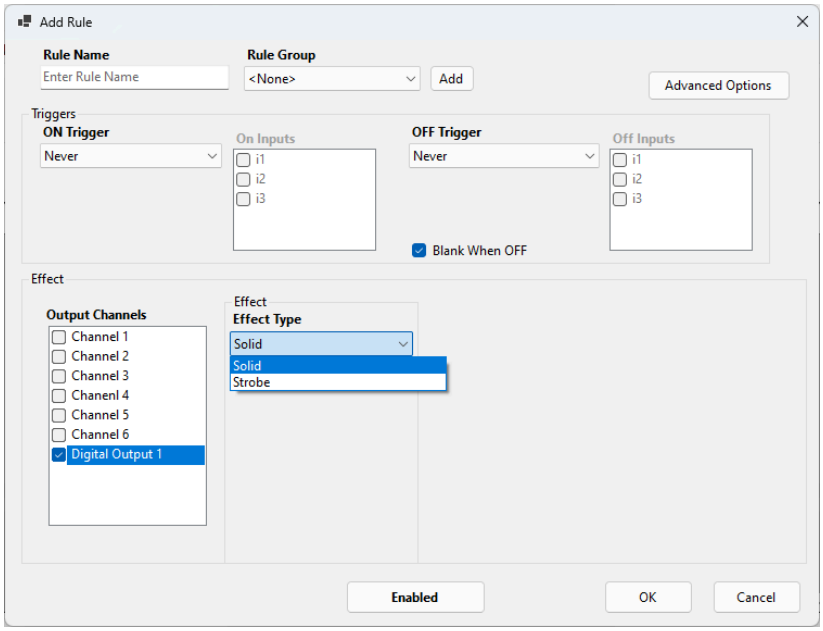
Effect Speed for PWM: Will determine how quickly the PWM will transition from the ON to OFF position. If set to 100%, the ON position will be sent and then the OFF position without any values in-between. If the effect speed is below 100%, the values in-between the PWM ON position and OFF position will be sent to the PWM servo motor or other device. For a servo motor, this will result in slower movement.

Values to use for servo motors vary, but for the MG90S servo motor, we are using 600 for the lowest position and 2500 for the highest position.

Keep in mind that servo motors are typically 5V. Do not try to hook up a 5V servo motor to a 12V power source.

Digital Outputs: Digital outputs are very simple.

- **Solid Effect -** When a rule is active, the Digital Output will also be active.
- **Strobe Effect -** When a rule is active, the Digital Output will strobe (power cycle) at a speed determined by the Effect Speed setting.



LED Effects: Effects allow you to select patterns you have previously defined and apply them to one or more LED output channels.

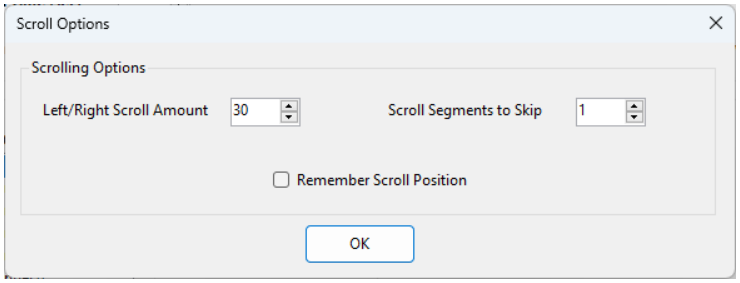
- **Solid -** This effect simply applies the selected pattern to the selected output channel(s)
- **Flashing -** This effect creates a flashing (or strobing) effect using the selected pattern. You can control the speed of the flash. Effect speed can be set to anywhere from 1 to 50 cycles per second.
- **Pulsating -** This effect creates a pulsating (or dimming) effect using the selected pattern. You can control the speed of the pulsating. Effect speed can be set anywhere from 1 to 50 cycles per second.
- **Scroll Left -** This effect will take the selected pattern and scroll it to the left as long as the rule is activated. Pattern segments can be longer or shorter than the boundaries of the physical LED strip segments, depending on the desired effect.
- **Scroll Right-** This effect will take the selected pattern and scroll it to the right as long as the rule is activated. Pattern segments can be longer or shorter than the boundaries of the physical LED strip segments, depending on the desired effect.
- **Scroll Left/Right -** This effect will take the selected pattern and scroll it to the right as far as it can go and then scroll it to the left. It will alternate between left/right scrolling as long as the rule is activated. Pattern segments can be longer or shorter than the boundaries of the physical LED strip segments, depending on the desired effect.

NOTE: Under *Scrolling Options*, Set the **Scroll Amount** to a value of 2 through 255, which will determine how many positions to the left and right your pattern scrolls before reversing. You will want to adjust this depending on your pattern.

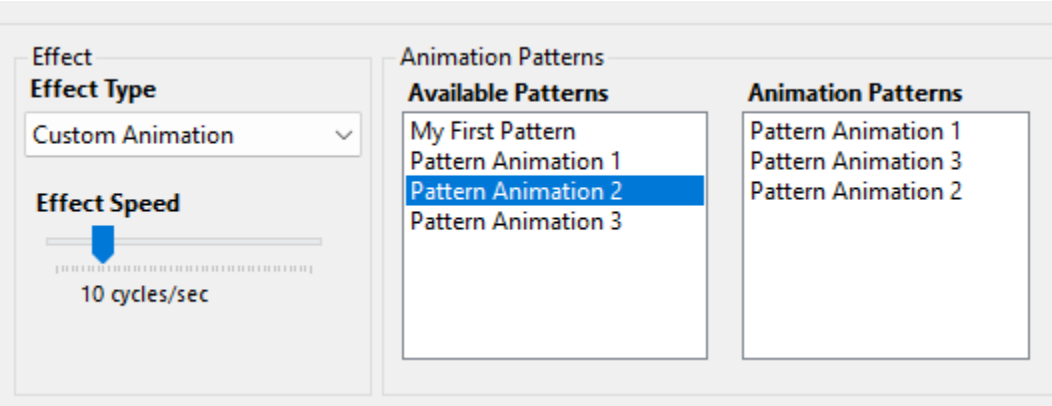
Left/Right Scroll Amount only applies to the Scroll Left/Right effect. This setting will determine how many positions the left/right effect will scroll before the scrolling reverses. This value can be any number between 2 and 255.

Scroll Segments to Skip - In some cases, you may need your scrolling effect to occur even faster than allowed by the speed control. In these cases, you can set a number of LED segments to skip while scrolling providing the illusion of a much faster scrolling effect.

Remember Scroll Position specifies whether you want the scrolling or gradient effect to remember the last scroll position. If unchecked, the scrolling will always start over at the same location every time the Rule is deactivated and reactivated. If checked, the scrolling will remember where it was previously and continue scrolling as the Rule is deactivated and reactivated.



- **Fade In -** This effect will fade the pattern into a solid pattern when the rule is activated. The Effect Speed will determine how fast or slow the pattern fades.
- **Fade Out -** This effect will fade the pattern out when the rule is deactivated. The Effect Speed will determine how fast or slow the pattern fades.
- **Fade In/Out -** This effect will fade the pattern into a solid pattern when the rule is activated and fade it out when the rule is deactivated. The Effect Speed will determine how fast or slow the pattern fades.
- **Custom Animation -** If none of the above effects suit your needs, you can create a custom animation by stringing multiple patterns together into an animation. The selected patterns will loop in the order they have been defined.



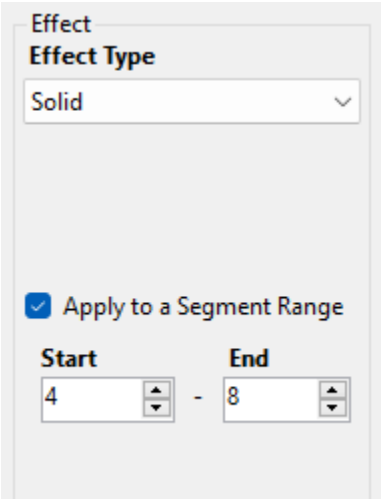
To add patterns to your own custom animation, drag the patterns you want to be a part of your animation from the Available Patterns box to the Animation Patterns box.

To change the order of your Animation Patterns, simply drag them to their desired location in the Animation Patterns box.

To remove a pattern from your own custom animation, drag the pattern you want to remove from the Available Patterns box back to the Available Patterns box.

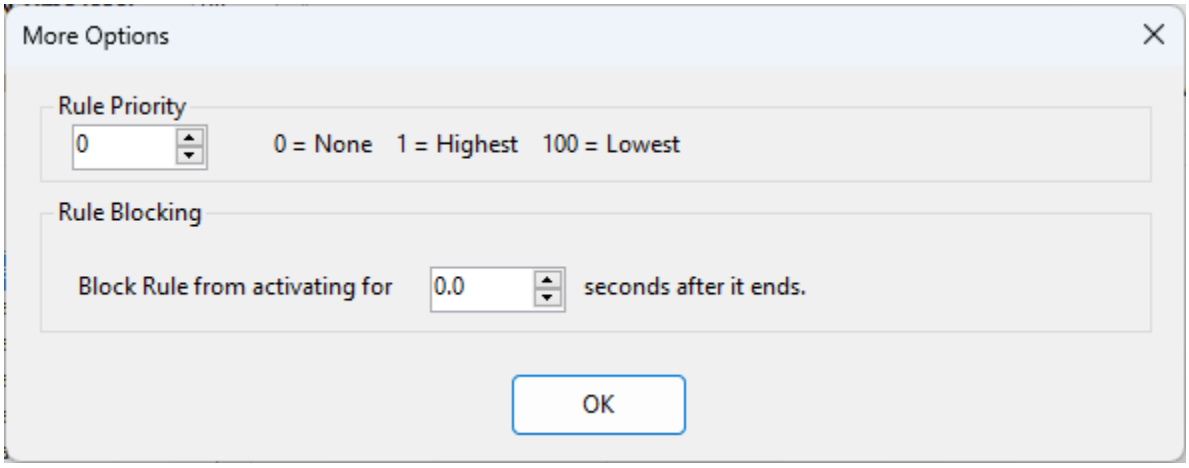
Use the **Effect Speed** slider to specify how fast you want the animation to run. The speed can be between 1 and 50 cycles/second.

Apply to a Pattern Range: You can apply effects to a segment range. This means that the rule will only affect the segments on the output that you specify. If you specify 4 to 8, then only segments 4 through 8 on the designated LED strip will be affected. You can set up two rules – one affecting segments 1 through 4 and the other affecting 4 through 8. This allows you to apply multiple effects to the same LED strip if desired.



MORE OPTIONS

The *More Options* button will bring up this dialog:

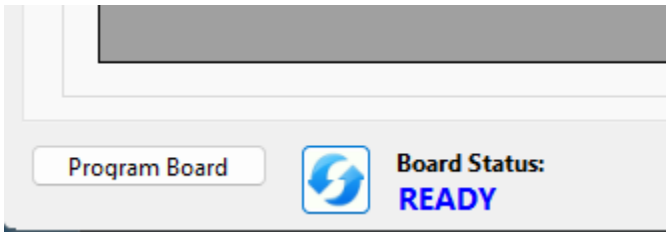


Rule Priority: If two rules are running simultaneously and controlling the same output channel and segments of an LED strip, the priority determines which Rule will take precedence. Priorities can be between 1 and 100. The lower priority takes precedence, so Priority 1 would override Priority 10. Priority 0 means no priority is set and the rule will run simultaneously with any other rule and will not be overridden.

Rule Blocking: There may be cases where you do not want a Rule to activate too often. Here, you can set a timer that will prevent the rule from being activated for the specified amount of time after the Rule deactivates. If you find an effect is triggering too often, you may want to utilize this feature.

PROGRAMMING THE BOARD

To program the board, simply click the Program Board button. It should take less than 2 seconds to fully program and reset the board. When programming is complete, you will receive a *Success* message that will display momentarily. As you are making changes, you can frequently program the board to test the results.

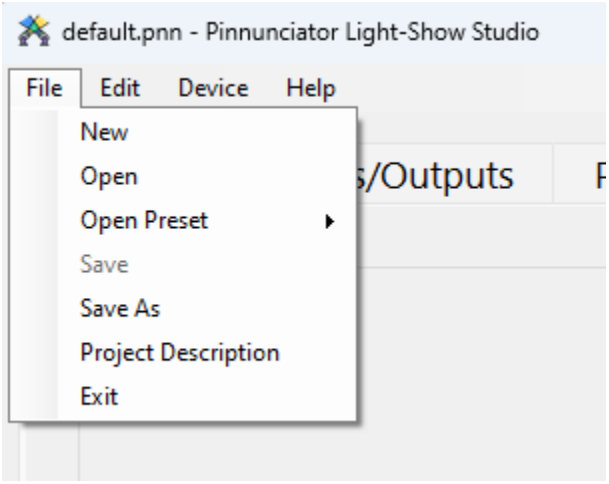


NOTE: Programming can be performed with or without +12V power applied to the board.

LOADING/SAVING CONFIGURATIONS

You save and load configuration using the options on the FILE menu.

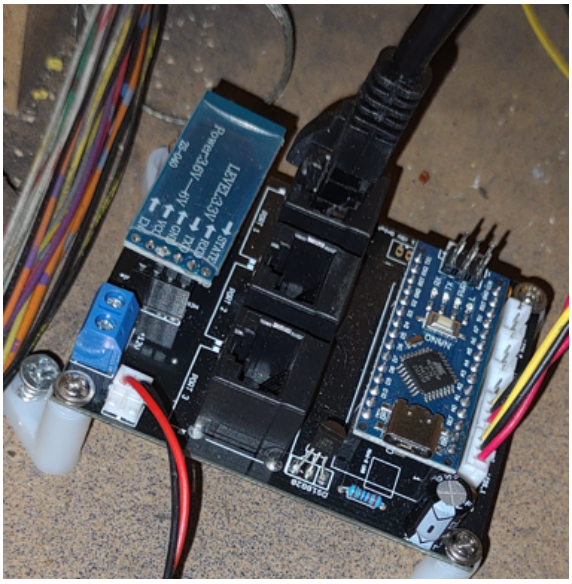
- **New -** opens the default configuration with default input, output, and color palette settings. You will lose any unsaved changes.
- **Open -** opens the dialog to load a configuration that was previously saved
- **Open Preset -** provided are some built-in presets as examples
- **Save -** overwrites the currently loaded configuration with any changes that were made
- **Save As -** opens a dialog to save the current configuration with a new filename.
- **Project Description** - opens a dialog that allows you to enter a description of your configuration. Provide any wiring instructions or special notes here. This description will pop up whenever your configuration is opened.



THE HC06 BLUETOOTH MODULE FOR WIRELESS PROGRAMMING

The HC06 Bluetooth Module can be plugged into the Pinnunciator for wireless programming. It cannot be used to update firmware. Updating firmware requires a USB cable connection and also requires that the HC06 Bluetooth Module is unplugged.

We recommend powering off the Pinnunciator before unplugging or plugging in the HC06 Bluetooth Wireless Module.

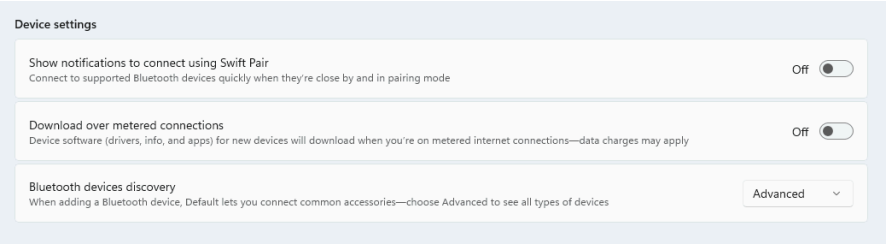


The above picture shows a properly installed HC06 Bluetooth module. Ensure that the 4 pins are aligned properly.

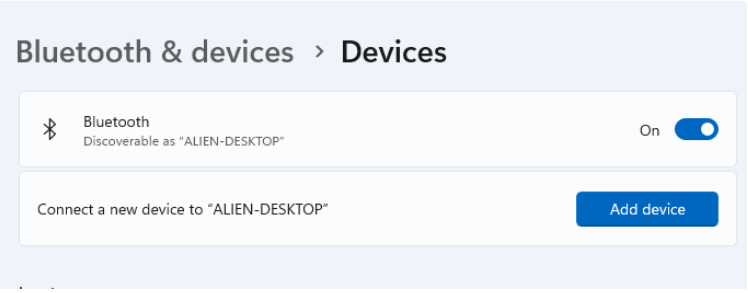
Connecting to the Pinnunciator Wirelessly:

FREQUENTLY ASKED QUESTIONS

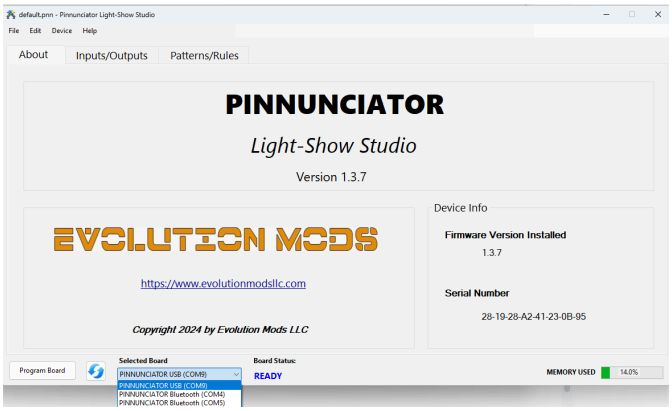
1. In Windows, click the *Start* menu and start typing Bluetooth. Select *Bluetooth and other devices settings.*
2. Ensure that *Bluetooth devices discovery* is set to *Advanced.*



3. Ensure that Bluetooth is turned on and click the *Add device* button.



4. You will see two HC06 devices. One of them is the correct one and one is not. Select one of them. If you are prompted for a password, that is the correct one. If you are not prompted for a password, disconnect from that device and connect to the other HC06 device. It is critical that you disconnect from the incorrect HC06 device.
5. Enter the password. The password is 1234
6. Now you are connected, open Light Show Studio and select a Bluetooth COM port. If the first one you try doesn't work, try the other one. Once you see the READY prompt, you are connected and can program your Pinnunciator wirelessly just as if it were plugged in via USB.



TROUBLESHOOTING