

SDS WiPars
Owners Manual

I.	SDS WiPars Features.	pg.2
II.	Hardware Setup	pg.3
	A) Radio Controller	
	1) MIDI I/O Connections	
	i) Slider's MIDI out	
	ii) Remote MIDI Control (WiMIDI's)	
	2) Radio Link	
	i) Connection Procedure	
	ii) Placement of Controller	
	B) WiPar Lights.	pg.4
	C) MIDI Receivers	
	D) Microphone Level	
III.	WiPar "Stand-Alone" Modes.	pg.5
	A) Adjustment Pot	
	1) Adjusting Color Lights	
	2) Adjusting White Lights	
	3) Overheat Protection	
	B) Auto Play Modes	
	C) Radio Controller take-over	
IV.	Using The Controller.	pg.6
	A) Dimmer Slider Controls	
	B) Panel Indicators	
	1) Connection Status	
	2) Changing the Radio Channel	
	C) Auto-Play Modes	
	D) Slow-Dim Function and settings	
	E) MIDI/Panel Take-over.	pg.7
	1) Using MIDI CC's to as dimmers	
	2) Using MIDI Notes to flash	
	3) Strobe Mode	
	4) Setting Controller Auto-Play Modes	
	F) Batteries & Charging	
V.	Specifications.	pg.8
VI.	MIDI Implementation Chart.	pg.8
VII.	Known Issues / Troubleshooting	
VIII.	Schematics	

I. SDS WiPars Features

At last, a Par Can Controller that doesn't need 200' of extension cords or special MIDI/DMX cable runs all across the stage!

This system isn't like most wireless lighting systems. The lights have no batteries to charge so are light enough to clip on anywhere, and have an impressive 56-62 LED Watts each, or equiv. over 280 Lighting Watts each, making a combined brightness equal to 850 Watts! They can be plugged in anywhere within range of the controller.

Controller options enable the dimmers to be very slow and smooth, or to fade-up/down quickly. The simple layout selects a Red, Green, or Blue WiPar, then mixes it with White from all Cans. Each WiPar can be used as a stand-alone without the controller, and has 4 different "auto-play" functions, one of them random, so they're never repetitive.

Auto-play can also be set from the controller's select button, and offers more options including a Mic for sync'ing to music!

Using the controller with MIDI means controlling other lighting, like the Light Bar using special CC's, that will raise/dim the same colors, or any other system using the same CC's. In other words, the 4 sliders (R,G,B,W) output the MIDI CC #'s 24, 28, 32, & 36 consecutively, on the same channel, 12.

The Controller also receives/ passes on MIDI data. The entire system can be controlled from the MIDI sequencer on MIDI Ch.12, with more options than the panel:

Strobe Mode: Each of the 3 WiPars (and OPT Light#4) has 4 strobe modes that can be set to any speed or strobe flash width. Color, White, Wiggle Left & Right Color, and All. These can be sent to each WiPar using the same speed and width (so they're in sync) or set for amazing effects when out of sync.

Flash Dimmer: The Panel controls use a smoothing algorithm to make sliders easier to move, but when using MIDI, the dimming might need to be faster and steppy. MIDI Notes and their velocities controls the flash dimmer by instant response. MIDI CC's, on the other hand, are still smooth, like the panel.

The control of lights via MIDI can be really simple, or very complex. The organized arrangement of notes and CC's makes sequencing pretty easy, and could almost be done from memory.

MIDI Thru: All data the Controller receives via MIDI is re-sent to the output, as would a MIDI Thru socket, with the exception of channel 12 Notes & CC's ranging #24 - #56. These are by default blocked, but can be unblocked with a note #55 (velocity > 50%) and re-blocked (velocity < 51%) inside a MIDI song.



nRF24L01+ Wireless

WiMIDI: As above, all of the MIDI data the controller receives at MIDI in socket is also transmitted via 2 wireless links. Addresses 04 & 05 have the same style of connection as the WiPars, but send slightly re-processed MIDI data to receivers. (Running Status Fixed, no SYSEX commands, and Channel 12 filtered as above)

Extra WiPar's (dumb slaves) and WiMIDI's can be added to the system if placed carefully providing a pretty substantial system, all with no wires!

II. Hardware Setup

Setting up the WiPar system is easy as 1,2,3, especially in a small area or space, but for more advanced and complex setups, outside (always bigger distances), or larger stages, some planning is involved!

A) Radio Controller

Referred to as "Controller" from here on in, this box is the magic part of the system. You can walk around with it while transmitting, find weak areas by looking at the connection statuses, and look really cool doing it!

Clipping up the WiPars, and sitting the Controller on a table at the venue may be all the setup that's needed, but more "automated" setups need wires going to the otherwise "free-as-a-bird" controller...

1) MIDI I/O Connections

When using with MIDI, the input needs to be connected for PC control of the lights, and the output for daisy-chaining to another MIDI unit if needed. Keep in mind some of Channel 12 is not sent "thru" (See Sect. IV.E & VI.) Programmed Note/CC data in a song gives the best control of the WiPars. After reviewing the MIDI Implementation chart, one can get a pretty good grasp on the easily ordered note structure for controlling each WiPar Can.

i) Slider's MIDI out

The Sliders also output MIDI CC data on CC# 60,62,64 & 65(left to right) so can be used to control some "same color" stuff in a smaller manual setup. <<In Auto-Play Mode, WiPar data is also sent on to MIDI out.>> To output Sliders as MIDI, (WiMIDI & MIDI Out) press the [ON] button so LED is off. Now the sliders are no longer controlling the WiPars. This mode can also be used to MIDI control a PC DAW, or NRPN's and BankSel LSB (32). BTW: These CC's control R,G,B & Y on Light 16.

ii) Remote MIDI Control (WiMIDI's)

The secondary feature Implemented is the Remote MIDI control. This enables communication with 2 or more WiMIDI receivers. Once a WiMIDI receiver is detected (on controller power-up) all MIDI data received at the controllers MIDI in will be sent on to it. (Except select MIDI CH 12 notes/cc's)

2) Radio Link

i) Connection Procedure

Wireless is a wonderful way of controlling, but certain procedures and knowledge of "what to do if it all goes wrong" is necessary. First, the initial link is accomplished by:

- a) Turn on all WiPar Cans and WiMIDI receivers FIRST.
- b) Turn on Controller.

All of the LED's representing each WiPar Can should come on solid. If they don't, then move controller closer and try again. Make sure NOT to press the [ON] button so LED goes off. This will cause a channel change and you'll have to go and re-power on all the WiPars and WiMIDI's. (See Sect. IV.B.2) Once the connections look good, move toward the location you want controller to be at, checking the status lights. (move a slider around to keep panel from battery saving dim-out)

ii) Placement of Controller

If using the control box, the most important factor is location, location, location! If you (the lighting person) are just a member of the audience with a trigger finger, making sure the Controller box will have a good connection with the lights is tantamount. Remember to consider there will be lots of people in the room, and at these frequencies, people make a good RF shield!

If the controller is going to be controlled by MIDI, then it needs to be up on stage. Make sure nobody is going to come in and sit a giant metal speaker in front of it. On the floor is good for being out of the way, but not good for broadcasting immense amounts of data. Try to get it up, at least bum level, or better yet way up high on top of something not metal.

* Note: Don't ever change channels unless interference is anticipated. Because an interference free channel may be found, it can solve problems, but also demands that the controller be left powered on so the channel is remembered. Only issue a channel change if all of the link indicators are flashing at the same time as if it's only one, then the issue is distance from that WiPar, and changing the channel may cause the WiPar to be left behind!

B) WiPar Lights

Clipping these on is pretty easy, just make sure they can't fall! The AC Mains each is on makes no difference, but make sure it's NOT on a dimmer controlled circuit. This would likely damage the hell out of the WiPar's power supply.

Keeping them all within a few feet of each other makes them more predictable link-wise, but if they are being used to light up different props etc. then further apart is better.

For field use, running the WiPars off of a generator or inverter shouldn't be an issue, so long as the voltage is 90VAC or above. The P.S. can easily take a 250 volt surge.

Keeping them dry in an outdoor environment is important, but don't plug the vent holes. If rain is in the forecast, mount them upside-down so the vent holes are on the bottom, then tilt them down a bit.

Cover the back halves with plastic bag and elastic band if it's really going to piss down!

C) MIDI Receivers

The WiMIDI receivers have their own ext. antenna so are less prone to link failure, which is important! The beacon transmission from the controller means no "stuck notes", and keeps skipped notes to minimum. (Retries). The two Bottom Yellow LEDs shows the status or these, but only if there's a link problem after the initial connection time (5 seconds) The problem connection will be flashing and will hold the panel LEDs on for as long as the bad connection exists. After a re-connect, and 5 seconds the panel will dim down again. This is so if there is even a small glitch in the WiMIDI link, it will be very noticeable!

Endless Number of WiMIDI's

* The Controller can send MIDI to 2 WiMIDI receivers, each sending back ACKnowledgement data, but more receivers with the same addressing as WiMIDI 1 (address = 04) can be used along with at least WiMIDI 1. These "phantom" receivers must have their ACK disabled though, or collisions will take place. The Controller needs at least one WiMIDI to be online if the others are to be used, or it won't recognize a valid link and will ignore that address. The "phantoms" must have the same address as the "real" WiMIDI that is online.

Phantom WiMIDI Receivers

* Due to this, special care must be taken when placing the "phantom" non-ACK type of WiMIDI receivers, because if they loose connection, for even a brief moment, the controller won't know to re-send the data packet.

Their location should be preferential, and if possible, closer than the WiMIDI 1 receiver.

WiMIDI Directionality

* The WiMIDI's are one direction only, and are useful for anything that doesn't need to send MIDI back. (Another type of MIDI transmitter must be used, on a different channel to simplify the system) I.E. Light bar (special power wiring), StripLights (barring the strobe send-on function), a midi/DMX globelight (built in), Synths (battery powered), Drums (battery powered), Other lighting (Light 16, stand-alones etc future)

D) Microphone Level

On the back panel of the controller is a pot to adjust the gain of a microphone that controls the auto-play function sequences. Setting this level can be done on-the-fly but it is crucial to adjust it, especially with varying types of music. i.e. A loud club scene would need the level almost off, where an acoustic (no amps) setup would need a lot of gain.

Also it depends on the effect one is looking for as a more full continuity of audio will act differently on the progression of Auto-Play sequences than a more infrequent level peak. A frequency counter of sorts can determine the difference between bass guitar and a kick drum (about the same frequency) but will act differently on Auto-Play setting 4 or 5 than it would on 1 or 2. (kicks would be ignored)

In any case, this gain setting should be considered / adjusted if using Auto-Play.

III. WiPar "Stand-Alone" Modes

A) Adjustment pot

If the controller isn't available or being used, the WiPars can still be used in "Stand-Alone" Mode. This mode is the default when the lights are first powered up. The color and white LEDs are controlled using the pot on back.

1) Adjusting Color Lights

By default, upon initial power up, the pot controls the colour lights. If it is controlling the whites, then press the button twice to return control to the color lights.

2) Adjusting White Lights

To control the whites, press the button once. Now adjust the pot and the whites will respond.

*The whites alone can be left on full without causing an overheat mode, but the colors can cause overheat mode even when the fan is running full on. (See below)

3) Overheat Protection

Even with all of the heat sinking and fan, the WiPars put out so much light that eventually they overheat. For most stage-wash lighting, these will never be used statically in a full-on setting as they are simply too bright! But if they are, and overheating occurs, then a special routine kicks in and slowly dims the lights. It's barely noticeable as it dims very slowly. Once the temperature has stabilized, the light may stay in overheat mode until the fan (if ever) cuts out. ** Note: Over a period of time, even at moderate settings, the light's brightness may increase due to the drivers heating up. This will make them brighter and cause the over heat mode to kick in.

B) Auto Play Modes

In Stand-Alone mode there is also a set of auto-play modes so the light will rise and fall slowly.

Press and hold the button to get into the Auto-Play menu. Then press button 1,2,3,4 times to select:

- | | |
|--------------|--|
| Once: | Fast fade just color |
| Twice: | Slow fade just color |
| Three times: | Fast Play whites and color alternating |
| Four times: | Slow Play whites & color alternating with a random component |

The 4th Auto-Play mode has a random component (temperature off of the heat sink) added in so lights are never in sync, just rotating through colors the same way. Depending on when the light was set, the colors will always be changing. Keep this in mind if using with the other WiPars!

C) Radio Controller take-over

The moment a WiPar receives a valid signal from the controller, it goes into radio mode. Only power down can put it back into Stand Alone mode.(With the controller off or out of range)

When the controller is powered up, it "searches" to see which WiPars / MIDI rx'ers are in range and marks them as online. With the WiPars, the corresponding LED (Red, Green, Blue, or white for the optional White Light) will light. If the LED above a slider is not lit after the startup splash, the controller did not detect that WiPar.

Because the controller sends out a beacon, the WiPar could be turned off then on and still it would go into radio mode. The beacon is sent every 1/4 second and is used to signal the quality of a connection.

IV. Using The Controller

The wireless controller is the main function of the WiPars. It can be run off of it's battery pack (7.2V) or plugged in using a 12 volt adapter, which will also charge the batteries. Panel "auto-dim" will kick in after 5 seconds of no motion on the panel, thus saving battery power.

The Panel can be "taken over" via MIDI on Channel 12, but can also be a fully self contained dimmer controller for the 3 WiPars Cans, and one optional light.(Pin spot or one more WiPar, panel controllable only with the white slider.)

A) Dimmer Slider Controls

After initial connection to the WiPars, the dimmers will adjust each color light's color (left & right together) and the white slider will adjust all of the white lights in all WiPars together. This is for simplicity.

*Feature: When orange LED is off, the sliders send data to MIDI out for CC's C5,D5,E5,F5 (r,g,b,y on Light16)

B) Panel Indicators

1) Connection Status

The 2.4 GHz connection is bi-directional, that is the WiPars/WiMIDI's talk to and listen to the controller.

Above each slider is a colored LED that matches red, green & blue sliders. This LED indicates a connection by:

Flashing: Had connection but now lost.

Solid On: Connection is good

Off: Never made connection on start-up. Try re-cycling panel power to initiate a new search.

Dimly flickering: It looks this way in battery save mode.

2) Changing the Radio Channel

At power up, all of the initial links to the WiPars are done on default Channel 99. During normal operation, a beacon is sent every 1/4 second to ensure a connection, slowly shut down a WiPar if connection is lost, and stop "Stuck MIDI notes" with the MIDI receivers.

When the connection is poor, you may notice (when the panel is bright, not dimmed) that the LEDs above the sliders are flickering randomly. This may indicate a failing connection due to wide-band interference.

Moving the controller closer may be an option, but if can't be done then perhaps changing to a different channel would improve the connection.

To change the channel, hold the [ON] button down for 2 seconds. Release and voila, new channel! There's a lot going on inside the controller when this is done, which is why it can't be done easily automatically. First, the controller goes into receive mode and scans the entire 125 channels randomly. As "good" channels come up they are committed to memory, then once 10 channels have been saved, one of them is picked as the "new" channel. All of this takes 1/3 of a second, so a beacon is skipped, which is why you may have noticed all of the connected LEDs flashed for a moment.

Keep in mind, that the controller cannot be powered down (as of this writing) because it will forget what channel the WiPars are on! They will all need to be reset (powered down / up) to get to default channel 99 again.

C) Auto-Play Modes

There are 5 auto-play modes, selectable using the [SEL] button. These auto play modes take over slider control. The slider's setting acts as a brightness limiter during auto-play, but for full (unlimited) auto-play control, the slider for that color, and/or whites can be left all the way down.

The Auto-Play modes are all influenced by the microphone. Adjust Mic gain (on back) to get the best effect.

The 6 Yellow LEDs show which auto play is selected (or off) as follows.

LED 1: Auto-Play is off

LED 2: Auto-Play #1: Smooth Slow fades. Minimal Mic response. Good for classical music.

LED 3: Auto-Play #2: Smooth faster fades. Slow Mic response. Good for light acoustic.

LED 4: Auto-Play #3: Fastest fades. Fast mic response. Good for lively acoustic

LED 5: Auto-Play #4: Flash Mode 1. Good for a club, disco.

LED 6: Auto-Play #5: Flash Mode 2. Good for a disco dance floor.

D) Slow-Dim Function and settings

The button marked [SLO] will smooth the dimmers (sliders) fade reaction time depending on the time setting.

To Set the time (from 1 second to 8 seconds) hold the [SLO] button for at least one second, and adjust the white slider. The higher the slider, the slower the fade time. Once the button is released, the green LED will come on.

To bypass the low fader without re-adjusting, just press the [SLO] button to turn off the green LED.

E) MIDI/Panel Take-over

The panel can be connected, via MIDI In, to a controller or PC for virtual and automation MIDI control through MIDI Channel 12. All of the panel functions, and more, can be controlled via MIDI.

1) Using MIDI CC's as dimmers

There are a total of 16 MIDI "Control Change" inputs assigned to the WiPars dimmer function.

Each WiPar has a Left Color, Right Color, White, and Speed Control as follows: [CC numbers in brackets]

Red Left: C2[24]	Red Right:C#2[25]	Reds White: D2[26]	Speed:Eb2[27]
Gm Left: E2[28]	Gm Right:F2 [29]	Gms White: F#2[30]	Speed:G2[31]
Blue Left: Ab2 [32]	Blue Right:A2 [33]	Blues White:Bb2[34]	Speed:B2 [35]
OPT 1: C3 [36]	OPT 2: C#3 [37]	OPT 3: D3 [38]	OPT 4: Eb3 [39]

*NOTE: CC's 40 - 56 ARE RESERVED and shouldn't be used

2) Using MIDI Notes to flash

To Flash parts of the WiPars, MIDI Notes can be used (see table above)

Using notes has the advantage of being faster to set up, but removes the smooth element that CC's have. Each note's velocity controls how bright the light will be, and is instantaneous in response.

3) Strobe Mode

There is a special mode that turns the WiPars into strobes. Only a single note on/off is needed to initiate/stop it, thus saving on number of transmissions as would be required when using flash mode. Even better, each WiPars can be separately controllable, thus colors only can strobe, or whites only. If the settings are identical, the colors will flash in unison, if different, will "wobble" with a mind blowing effect! Here's how to setup the strobes:

Red Go E3[40]*	Gm Go F3[41]*	Blu Go F#3[42]*	OPT Go G3[43]
Red Width Ab3[44]	Gm Width A3[45]	Blu Width Bb3[46]	OPT Width B3[47]
Red Space C4[48]	Gm Space C#4[49]	Blu Space D4[50]	OPT Space Eb4[51]

Each Strobe has a setup that defines it away from default values. CC's can be used for setup, but as values are relative, notes are easier. The Width is how long the "flash" lasts. The Space, is how fast the strobe is.

These 2 velocities are seldom above 25% but can be anything of course.

Which of the 3 possible LEDs flash in each WiPar is set by the "Go" notes velocity as follows:

1-31 (<25%) :	White only
32-63 (25% but<50%) :	Colors only
64-95 (50% but<75%) :	Colors "Wiggle"
96-127 (>=75%) :	All (color & white)

* Note that if Panel Faders or CC controls are left above zero, the strobes may be slightly affected. Once strobe is finished, the faders or CC's will take over with a slow fade-in. Does not completely override Auto-Play (below)

4) Setting Controller Auto-Play Modes

As with the stand-alone mode, the controller has Auto-Play (see (C) in this section) modes. These can be accessed via MIDI, and are good especially at the end of a song for lighting continuity. Only one MIDI Note is used to set which Auto-Play mode you want. The Velocity of Note E4 sets which Autoplay:

#1=8-31, #2=32-63, #3=64-95, #4=96-126, #5=127 A velocity of ZERO is not recommended, use 1 - 8 (almost zero)

Because of the way some sequencers / hardware handles zero velocity Note-Ons, it is recommended that to turn off auto-play, use a note velocity slightly higher than zero. But this will only be used rarely....

* Any dimmer/Flash/Strobe note will turn off auto-play, even if it was initiated on the panel. If a MIDI Stop is received, and an Auto-Play other than "none" is selected, then Auto-Play will come back on.

Final word on MIDI:

All of the implemented Channel 12 Notes / CC's are NOT sent on to MIDI out socket, but notes above & below are (for Light16 etc. on same channel) This is to preserve other channels on the same port without causing issues with hardware following the SDS WiPars Controller.

F) Batteries & Charging

The power supply must have a 1/8" plug and be between 10 and 19 volts (un regulated <200mA) or 10 and 12 volts if a regulated (high amp > 200mA) is used.

When charging properly, the white slider's LED will blink Green. The unit, when on, will run off of the charging power. If the LED stops flashing when the unit is powered up, the power supply is insufficient to power the unit and batteries will be used instead.

Leaving the unit plugged in continuously is ok as the charge is pulsed so won't over charge the batteries.

V. Specifications

Specifications List and other information:

Controller:	
Battery	6 x 1.2 V AA NiMH (appx. 600 mAh)
Microprocessor	PIC16F74 @ 16 MHz
Radio Transceiver (Shockburst 125 channel)	nRF24L01+ 2.4 - 2.525 GHz @ 1 MHz bandwidth
Audio	LM386, Internal Microphone, Charge Pump & Level Trig
Internal Voltages	7.2 VDC, 5 VDC, 3.6 VDC
MIDI in → MIDI out throughput	< 1 mS / Command @ 31,250 Baud
MIDI in → Radio MIDI out throughput	2 mS /Command (Two units +), 1 mS/Command (Single)
MIDI Channels	MIDI Channel 12, Note/CC 24 - 56

WiPar Cans:	
Supply Voltage	90 - 250 VAC < 1 Amp (No Batteries) 72 Watts Max.
Internal Voltages	24 Vdc(RED), 30 VDC (Grn,Blu)@3A, 5 VDC, 3.6 VDC
Total LED Power / WiPar Can	56 Watts (Blue/Green), 62 Watts (Red) [eq TTL 870W]
Microprocessor	PIC16F57 @ 16 MHz
Total LED Channels	3 per WiPar, Max (incl. Optional) = 16
LED Drive	PWM & Smoothed PWM via MOSFETs
Overload Protection	P.S. Fuse, Fan, Thermal Sensor, Freeze-Kill AC Drive, Auto-Dim, Beacon Lost Detection, 25 second Static After-Play Dim Out (MIDI only)

VII.

MIDI IMPLEMENTATION:

2014UD: SDS WiPar Cans on same Channel as Light16 (12), same CC's for colours.

Notes. CC's in [] (CC's sent as slow fades, Notes as velocity Flashes)

Red Left: C2[24]	Red Right:C#2[25]	Reds White: D2[26]	Speed:Eb2[27]
Grn Left: E2[28]	Grn Right:F2 [29]	Grns White: F#2[30]	Speed:G2[31]
Blue Left: Ab2 [32]	Blue Right:A2 [33]	Blues White:Bb2[34]	Speed:B2 [35]
OPT 1: C3 [36]	OPT 2: C#3 [37]	OPT 3: D3 [38]	OPT 4: Eb3 [39]

Strobe Setup and Go: (Note off or any valid notes/cc's cancel strobe on that par can)

Red Go E3[40]*	Grn Go F3[41]*	Blu Go F#3[42]*	OPT Go G3[43]
Red Width Ab3[44]	Grn Width A3[45]	Blu Width Bb3[46]	OPT Width B3[47]
Red Space C4[48]	Grn Space C#4[49]	Blu Space D4[50]	OPT Space Eb4[51]

*Note Strobe Go Velocity sets: 1-31 white, 32-63 colors, 64-95 wiggle(colors), 95+ all (white & color)

MIDI TX: Sliders send on ch.12 Notes C5,D5,E5,F5 when "On" LED is off.

AUTO PLAY: #1 - #5 E4[52] (Uses Velocity to select: #1=8-31, #2=32-63, #3=64-95, #4=96-126, #5=127)

*Any Valid Dimmer/Flash/Strobe Note cancels. Off = VEL <8 BUT DON'T USE 0 (MAY NOT WORK)

Kill all: F4[53] Reset ControllerF#4[54] Channel 12 All**:G4[55] STOPCC Ab4[56]***

*Strobe's Go Note Velocity quadrants Control 4 "Types" of strobe: Color, White, Wiggle, All

**Note: Channel 12 is blocked from RF sending unless this note w/vel >63. Vel<64 resets it.

*** "All" CC message are blocked at a MIDI Play. (Holds lights where they are after a MIDI Stop)

Note: Enabling this feature will release initialization of any MIDI CC dimmers at Play Start.

SDS*

VI. Known Issues / Troubleshooting

Overheating:

In such a small, yet powerful package, it's almost impossible to run at a 100% duty cycle. Writing MIDI routines with this in mind will prevent any "disappointments" of not enough light at key points of a performance. (Due to Overheat Protection Dimming)

If using the units as a stand-alone, turn the pot until it's fully bright, then dim by half. Because the OPD sets a limit, if that limit isn't breached (about 60%) even if it does kick in (on a hot day) it won't be noticeable at all.

To prevent autoplay overheating (controller autoplay), turn down mic gain some if in "flash" mode (auto-play 4&5), or set sliders to limit max brightness of each color if in slow mode (auto-play 1,2,3)

Lights "sticking on" after MIDI song:

This seems to be an issue with FL Studio, but could happen anywhere. It may be the case that FL sends note on's before note off's in a new bar, or for the same note.

The best way to deal with this is to switch to an Auto-Play just as song ends (Note#52, velocity>8) which will take over...idle hands!

For a quick stop use Auto-Play 4 or 5

Auto-Play causing issues during MIDI song:

Turn off Auto-play at beginning of song (Note#52, velocity<8...almost zero but not!) then back on after.

In Auto-Play the lights flicker, but don't "dance":

Adjust the pot on the back, may be too low or too high. This is mic gain! Auto-play 4&5 are designed to follow beat.

Connection indicators flicker:

This is normal unless the LED starts flashing off noticeably. This means the connection has been lost. I've noticed that mounting the lights higher yields better results. Low mounts often are susceptible to RF scattering effect. Remember also that: a light that didn't connect on power up will never connect, but a light that has connected, even if powered down, will re-establish a connection. That is why it's important to make sure the initial power-up captures all of the lights (and MIDI remotes if used).

VIII. Schematics ...