What are Smart Strings?

- Complete DIY solution for controlling RGB “LED” lights
  - Controllers
  - Power distribution
  - RGB lights
- Control thousands of RGB LED lights
- Create amazing displays

Michael Patten

INTRODUCTION TO SMARTSTRINGS

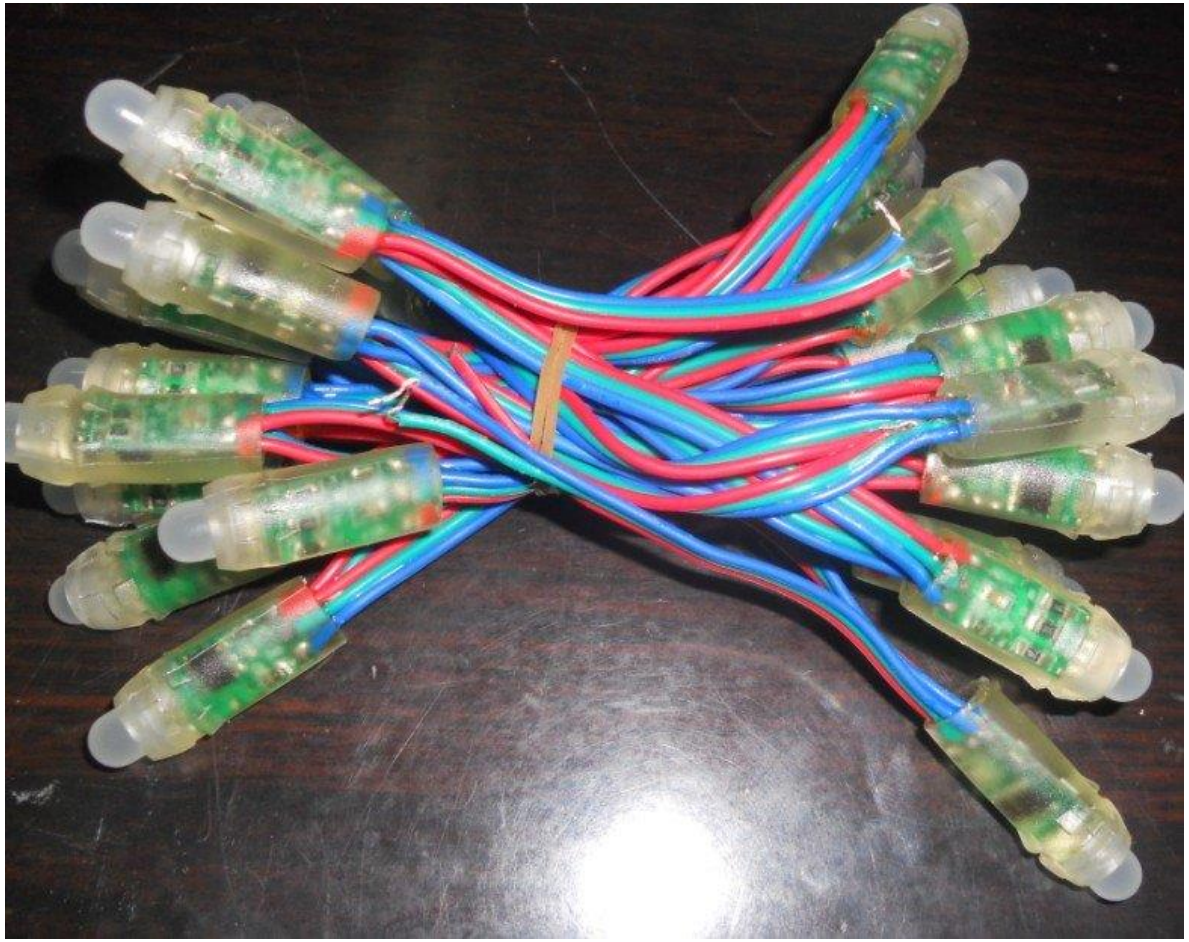
Why Smart Strings?

- Extremely flexible
  - High channel count
    - 4096 channels per hub
    - 4 hubs per dongle (16386 LED lights!)
  - Control both PixelNet and DMX devices from single hub
  - Easy power management
    - Easier cabling with data and power on single Cat5
  - Control multiple RGB SmartStrings throughout the yard with longer runs due to lower voltage drop (12v vs. 5v)
- Low price per pixel
- Works with existing software including Vixen, xLights and LightShow Pro
  - LOR can be used with xLights as scheduler
- Works with Lynx Etherdongle Conductor
  - PC free show scheduler
- Test and proven

Smart Strings Components

Component	Description
PixelNet Dongle	USB PC Controller
EtherDongle	Ethernet Controller
EtherDongle Conductor	Standalone Show Controller. Requires Etherdongle, Run your show PC free
SmartString Hub	Distributes Power and data to 16 SSC Inputs PixelNet from Dongle Output to SmartString Controllers
SmartString Controller (SSC)	Controller for SmartString Lights Connects to SmartString Hub
Smart Strings	RGB Lights

Smart String Pixels

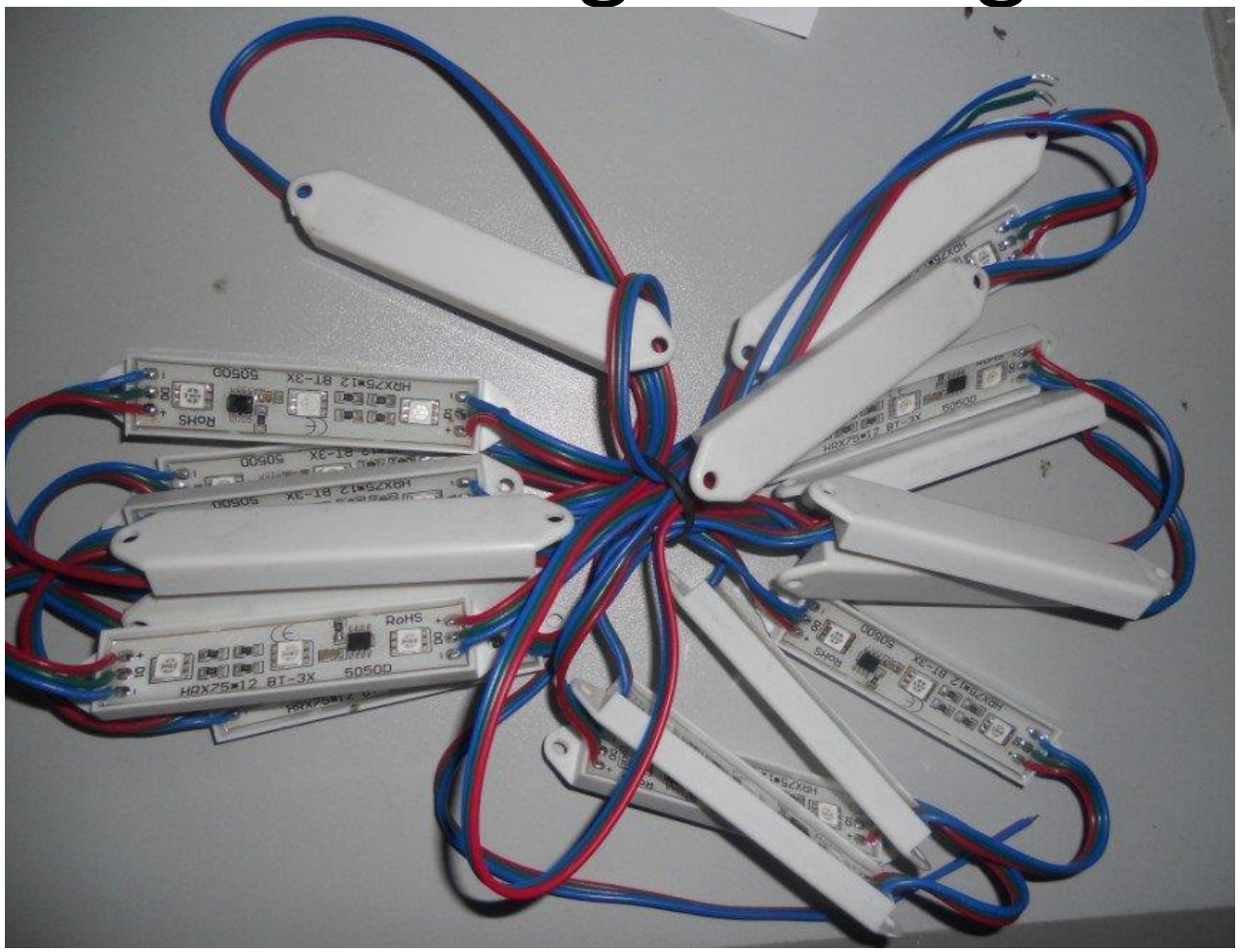


Available in 50, 75, 100 and 128 counts
3.5” spacing
Easy to cut and splice

Smart String Flex Strip

120 RGB Nodes
15 feet long
Cut at fixed locations

SmartString Rectangles



3.5” spacing
Group of 3 RGB per rectangle
Easy to cut and splice

Type of Smart Strings

		Length	Cost *
RGB Pixels	25, 50, 75, 100 and 128 count	3.5” spacing	US $10.00 (qty 25) By longer and cut
Flex strips	120 RBG LEDs per roll	14^{ft} long	US $48.00
Rectangles	Lots of 20	3.5” spacing	US $20.00
Rigid strips	18 mm		US $14

* Shipping NOT Included. Contact Ray for combined shipping!

Power Requirements

- Determine power requirements
- LED power requirements can quickly add up
  - Don’t underestimate your power requirements
- Standard PC Power Supply
  - Single Rail
  - 65+ AMPS
- Use high quality power supply
- Connect ALL connectors to hub

Newegg.com Example

Spec

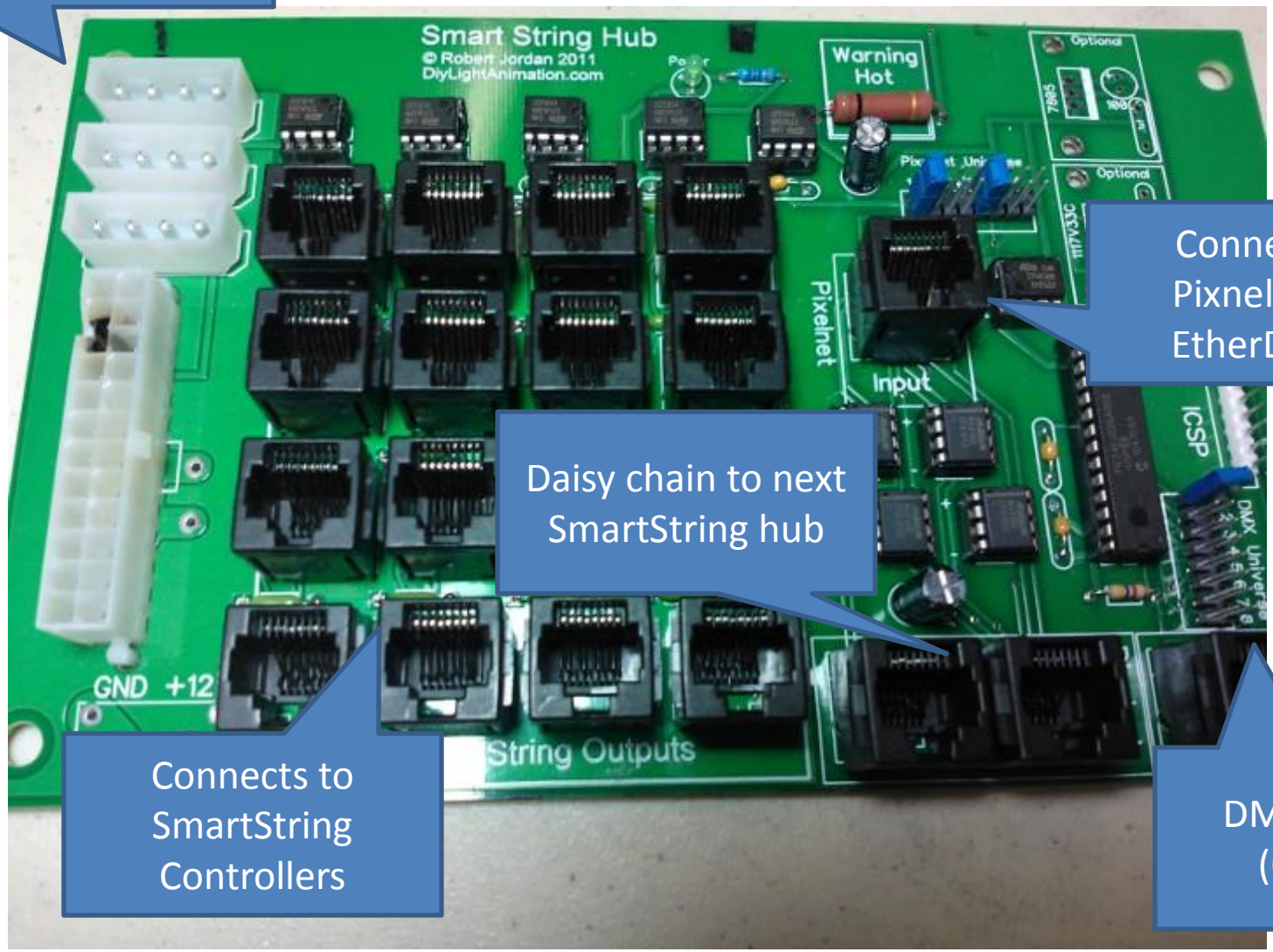
Type	ATX12V v2.31/ EPS12V v2.92
Maximum Power	750W
Fans	1
PFC	Active
Main Connector	20+4Pin
+12V Rails	Single
PCI-Express Connector	4 x 6+2-Pin
SATA Power Connector	8
SLI	Ready
CrossFire	No
Modular	No
Efficiency	Up to 85%
Energy-Efficient	80 PLUS BRONZE Certified
Over Voltage Protection	Yes
Input Voltage	90 - 264 V
Output	+3.3V@30A, +5V@30A, +12V@62A, -12V@0.8A, +5VSB@3.0A

$110

Example Power Requirements

- 128 nodes
  - 128 nodes x .356 watt = 45.57 watts
  - 45.57 watts / 12 volts = 3.7975 amps
  - 3.7975 amps + .05 amps = 3.8475 amps
- Full hub with 128 nodes.
  - require at a minimum :
  - 16 x 3.8475 amps = **61.56 amps**

Smart String Hub



Connect all connectors to power supply

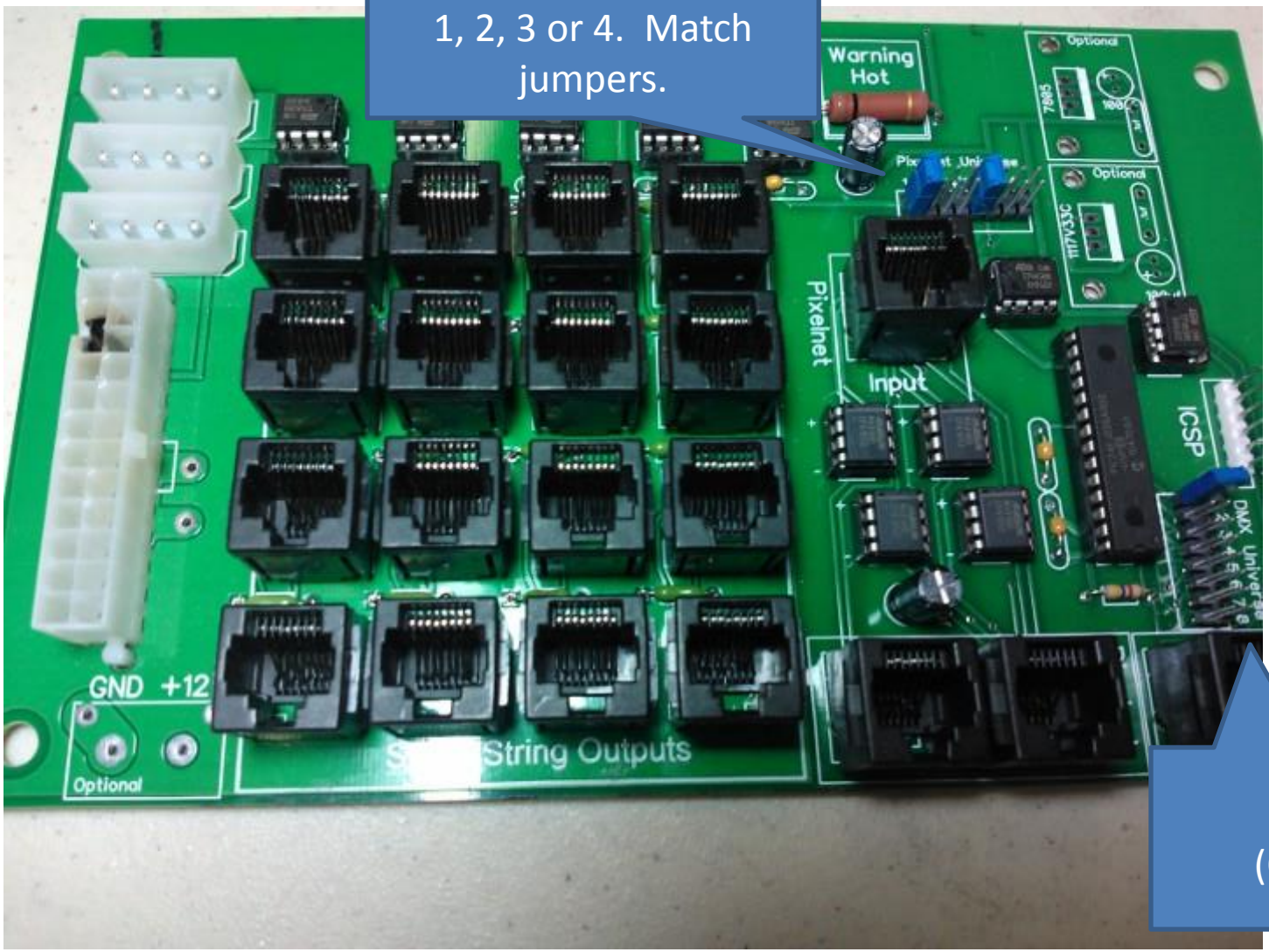
Connects to PixnelNet or EtherDongle

Daisy chain to next SmartString hub

Connects to SmartString Controllers

DMX Universe (Optional)

Smart String Hub

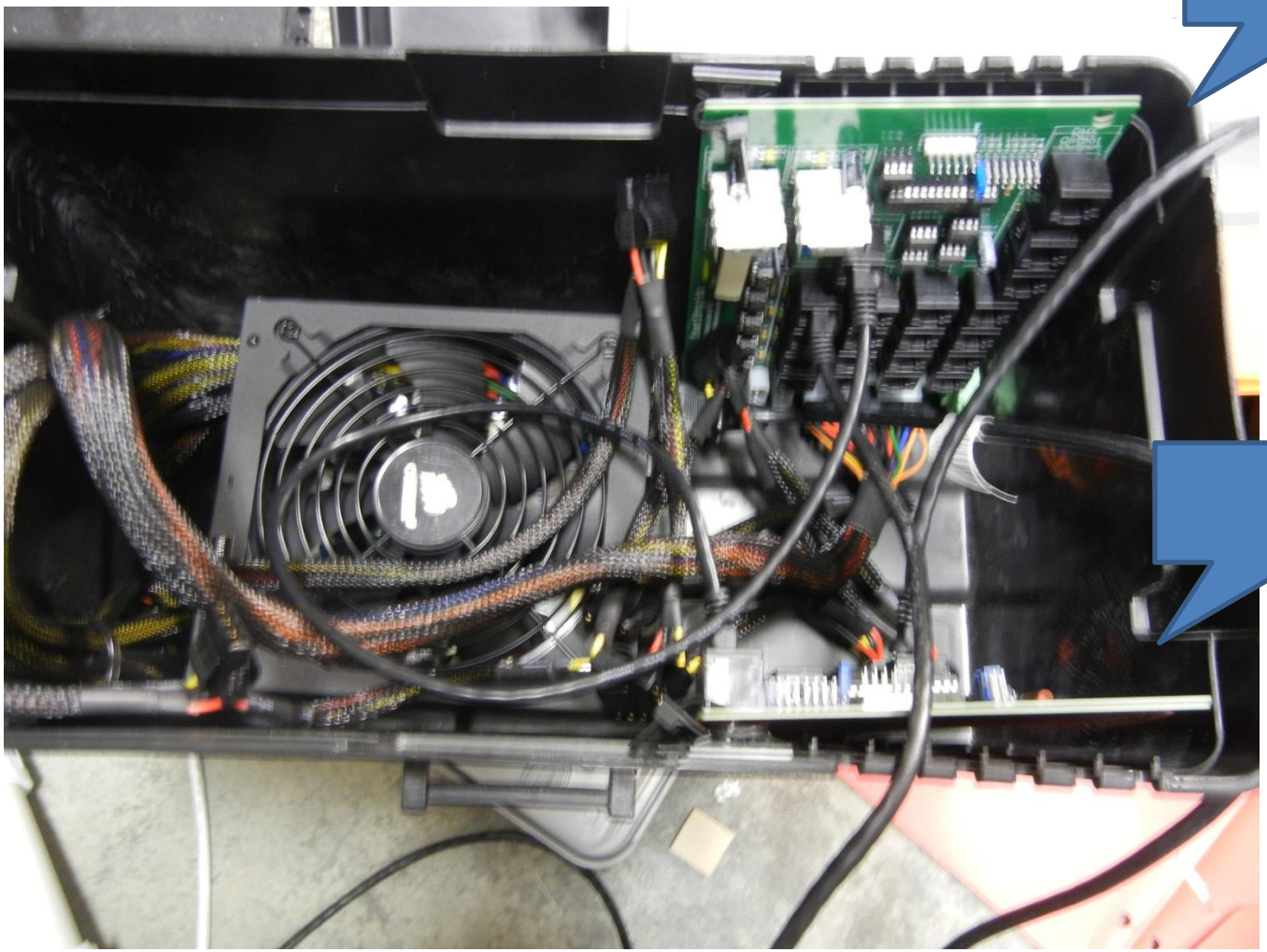


Smart String Hub

12 Volt options uses:
Power second Hub, DMX only, low current

Smart Strings Enclosure

- Marine battery box Walmart ~8$



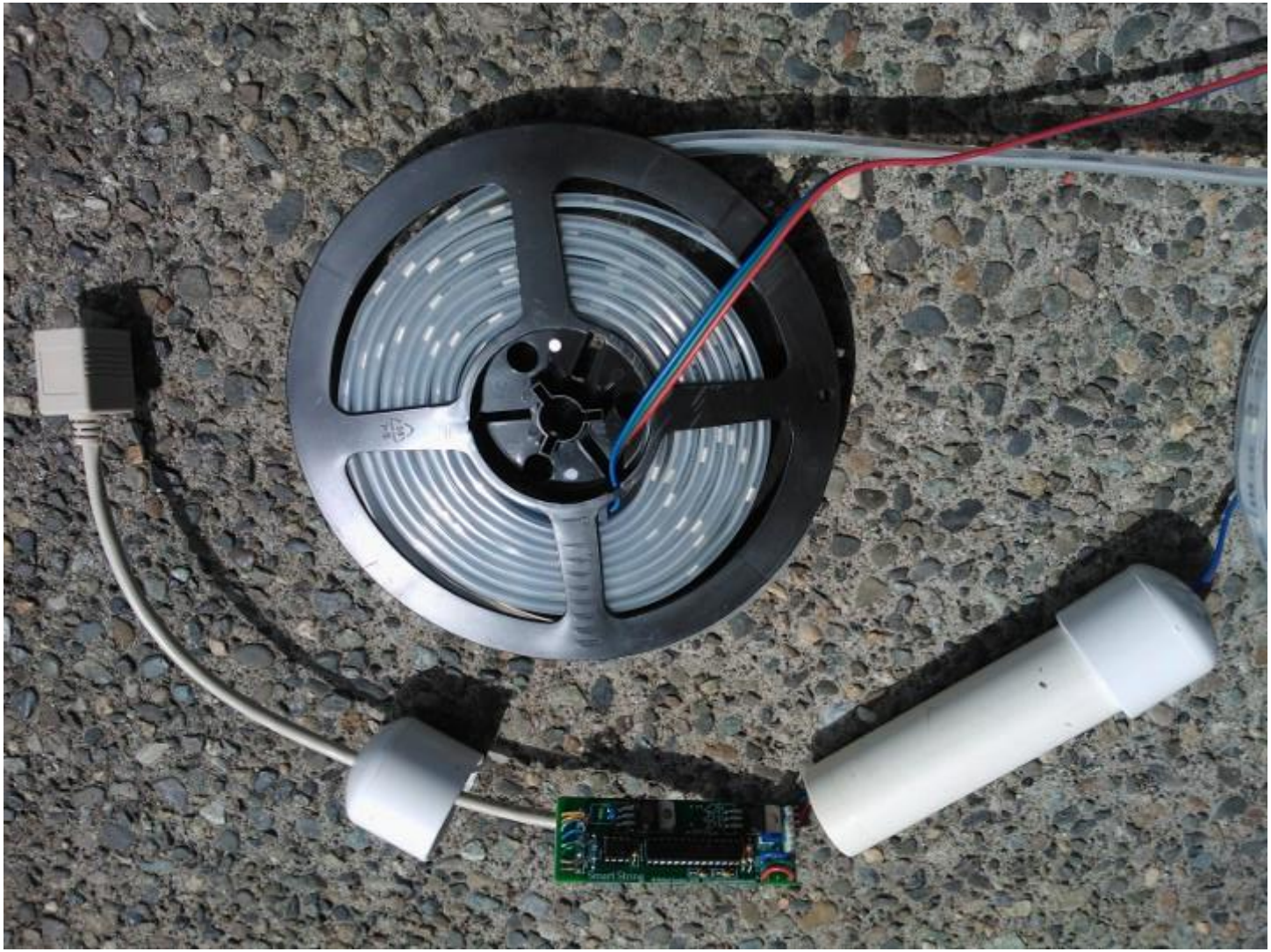
Smart String Controller (SSC)

Program / Operate Jumper

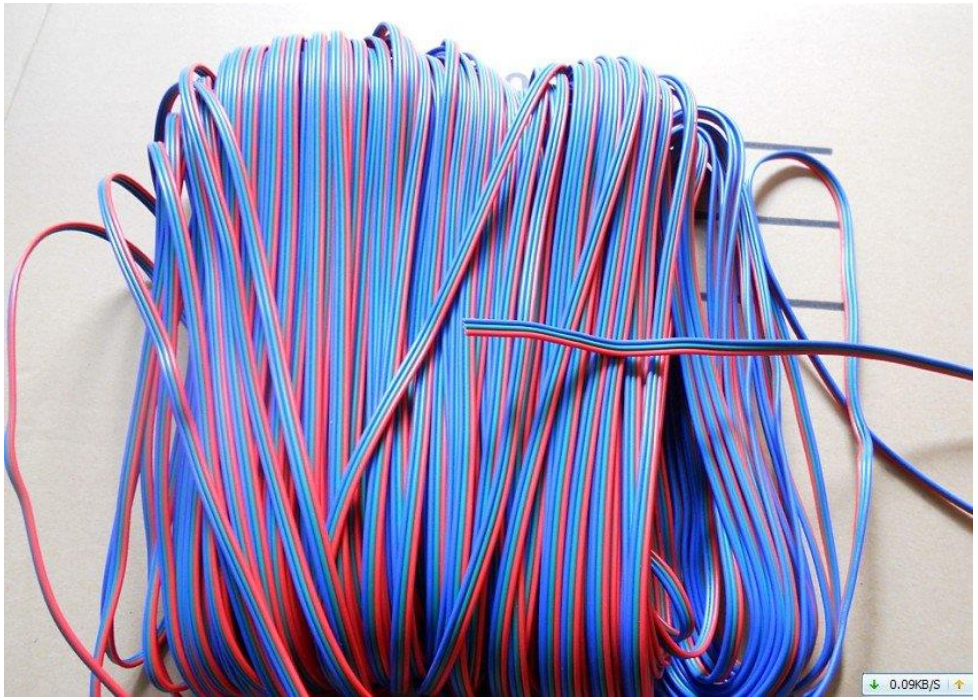
CAT5 to SS Hub

RGB Lights

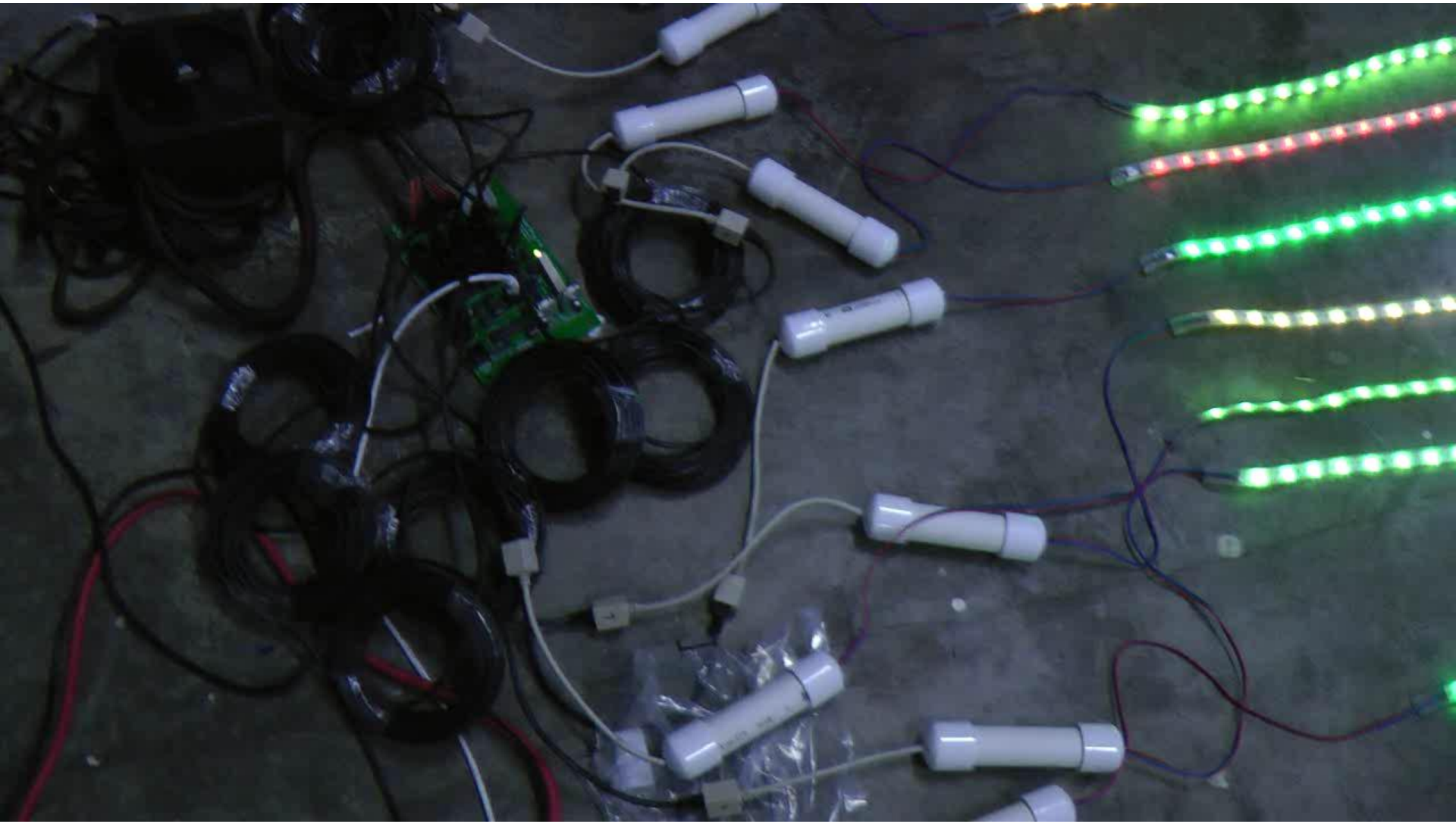
SSC + Flex Strip



Connectors



Testing

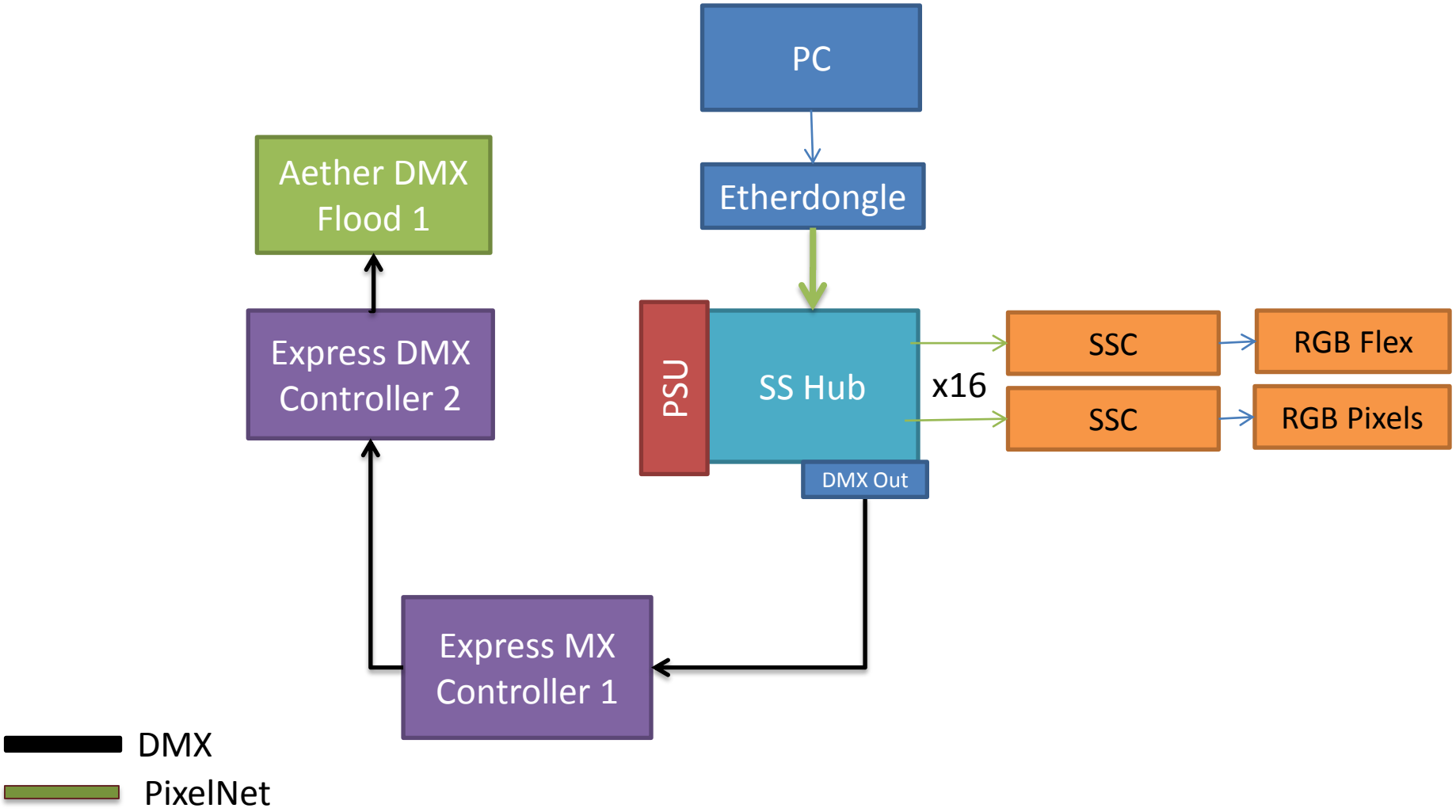


Weather Protect Controllers

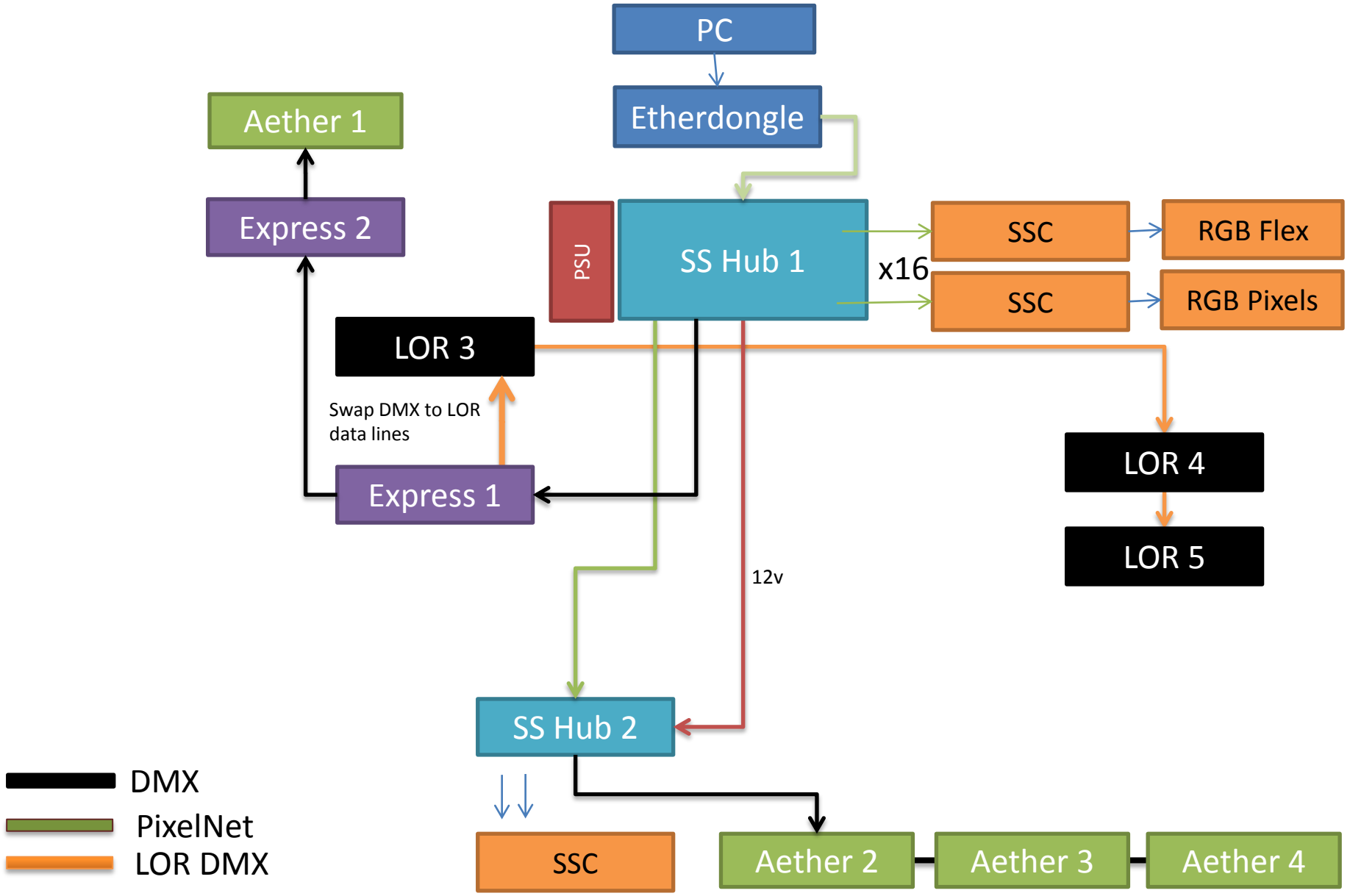
Standalone Controller

Useful for testing RGB pixels without the need of a PC
$20 + $20 for shipping from Ray Wu

Typical Setup



Advanced Setup



Understanding Chanel Numbers

- Most common error is due to channel numbers not being set correctly
- Lots of different set of numbers to track
  - PixelNet universe (Jumper 1,2,3 or 4)
  - Smart String Controller (1-4096)
  - LSP/Vixen channel number (1-16384)
  - DMX (1-512)
  - DMX Out (Jumper 1-8)
- Map out channels using Excel spreadsheet
  - Spreadsheet on wiki

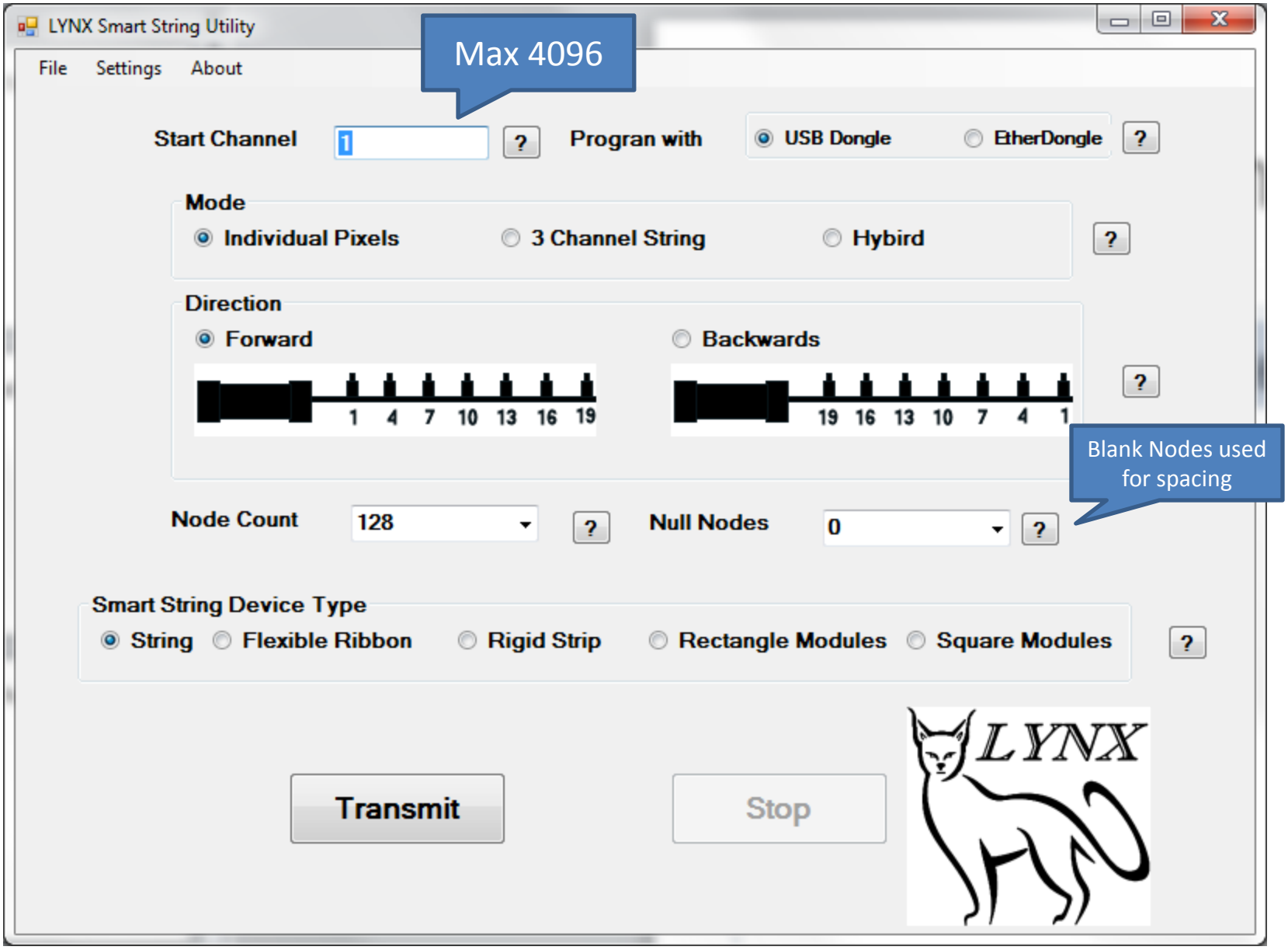
Understanding Channel Numbers

- Each hub supports channels 1-4096. (4 hubs per Etherdongle)
- Smart Strings Controller (SSC) should be programmed using the smart string configuration utility to values between 1 – 4096.
  - One common error is to program the SSC with a channel number greater than 4096.
- In Lightshow Pro, you can use the entire range of channels 1 – 16384 and the software will automatically map these to correct universe based on the E1.31 table below.

Hub	PixelNet Jumpers	SSC Channel #	LSP Channel #
1	1 & 1	1 - 4096	1 - 4096
2	2 & 2	1 - 4096	4097 – 8192
3	3 & 3	1 - 4096	8193 -12288
4	4 & 4	1 - 4096	12289- 16384

Programming SSC Channel Number

- Connect all CAT5 Cables
- Move jumper on SSC to program
- Apply power to Smart String Hub
- Start Smart Strings Utility
- Configure settings
- Press **Transmit**
- All lights flash white
- Move jumper to operate
- Press **Stop**
- Disconnect and reconnect Cat5 to SSC


LYNX Smart String Utility
File
Settings
About
Max 4096
Start Channel
1
?
Progran with
USB Dongle
EtherDongle
?
Mode
Individual Pixels
3 Channel String
Hybird
?
Direction
Forward
1 4 7 10 13 16 19
Backwards
19 16 13 10 7 4 1
?
Blank Nodes used for spacing
Node Count
128
?
Null Nodes
0
?
Smart String Device Type
String
Flexible Ribbon
Rigid Strip
Rectangle Modules
Square Modules
?
Transmit
Stop
LYNX

Using DMX Out

- Each hub can control a single DMX universe
- Use multiple hubs to control multiple DMX universes
- Jumper on hub reserves range of Pixelnet channels to use for DMX devices
- Its possible to control both PixelNet RGB + DMX channel together using a single channel number
- DMX devices (Express, Aether, LOR) most likely will have a different channel number than used in sequence software (Vixen, LSP)
- Don’t panic! Use Excel channel mapping XLS

Using DMX Out

Hub 1

DMX Jumper On Hub 1	DMX Channel # Express/Aether/LOR	LSP Channel # Start	LSP Channel # End
1	1 – 512	1	512
2	1 – 512	513	1024
3	1 – 512	1025	1536
4	1 – 512	1537	2048
5	1 – 512	2049	2560
6	1 – 512	2561	3072
7	1 – 512	3073	3584
8	1 – 512	3585	4096

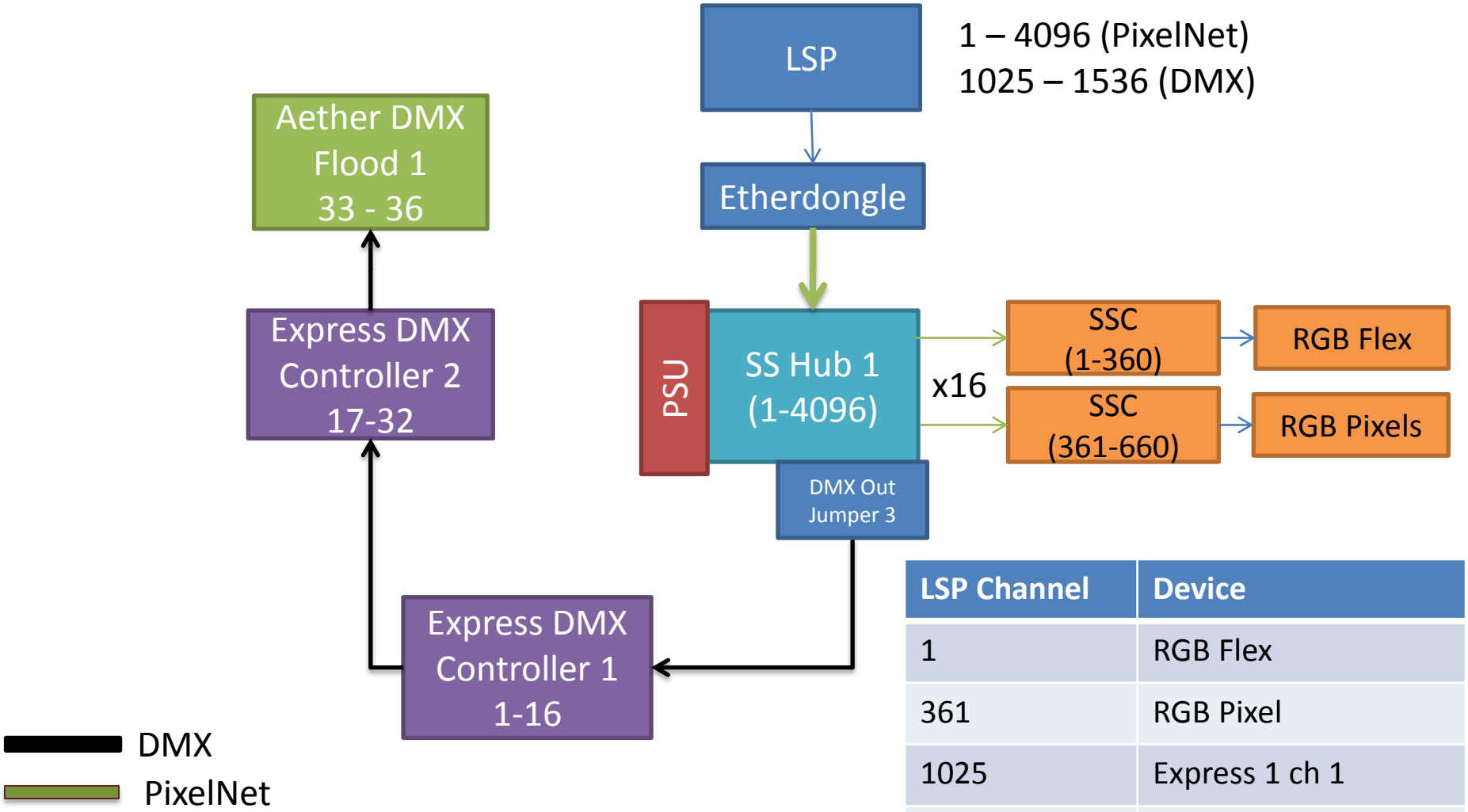
Hub 2

DMX Jumper On Hub 2	DMX Channel # Express/Aether/LOR	LSP Channel # Start	LSP Channel # End
1	1 – 512	4097	4608
2	1 – 512	4609	5120
3	1 – 512	5121	5632
4	1 – 512	5633	6144
5	1 – 512	6145	6656
6	1 – 512	6657	7168
7	1 – 512	7169	7680
8	1 – 512	7681	8192

PixelNet and DMX Example

- Assume DMX jumper = 3 on Hub 2.
- LSP channel **5121** will control DMX channel **1** + any SmartString LED programmed with channel **1025** connected to Hub 2
  - Remember SSC map to 1 - 4096 for each hub
  - 1025 = Channel 5121 – Max per hub 4096
- DMX devices still use channels 1-512

Channel Numbers

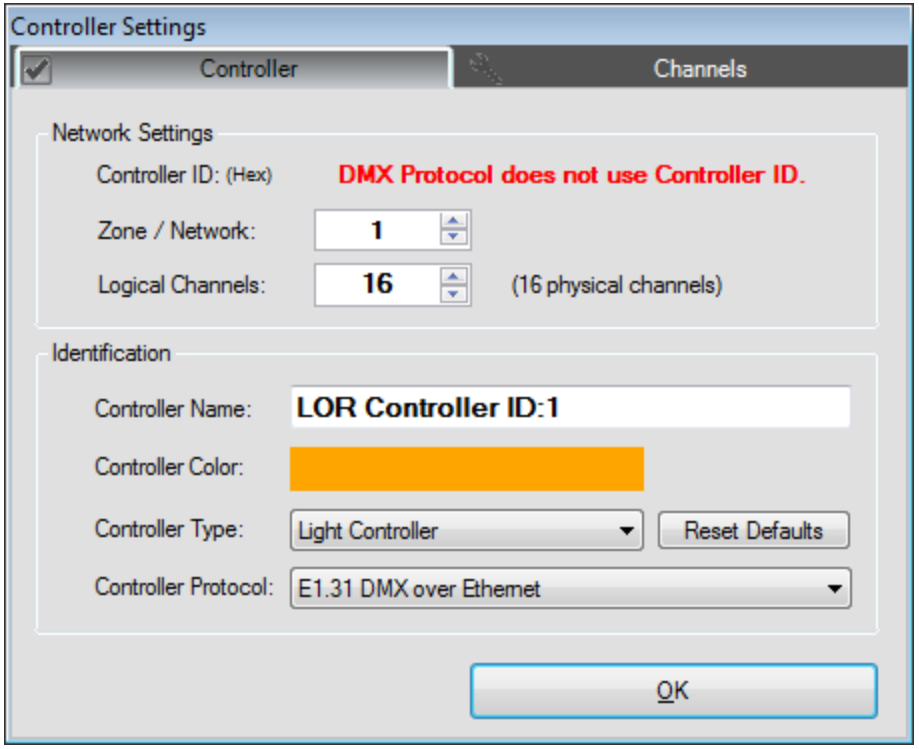


LSP Channel	Device
1	RGB Flex
361	RGB Pixel
1025	Express 1 ch 1
1042	Express 2 ch 17
1058	Aether ch 33

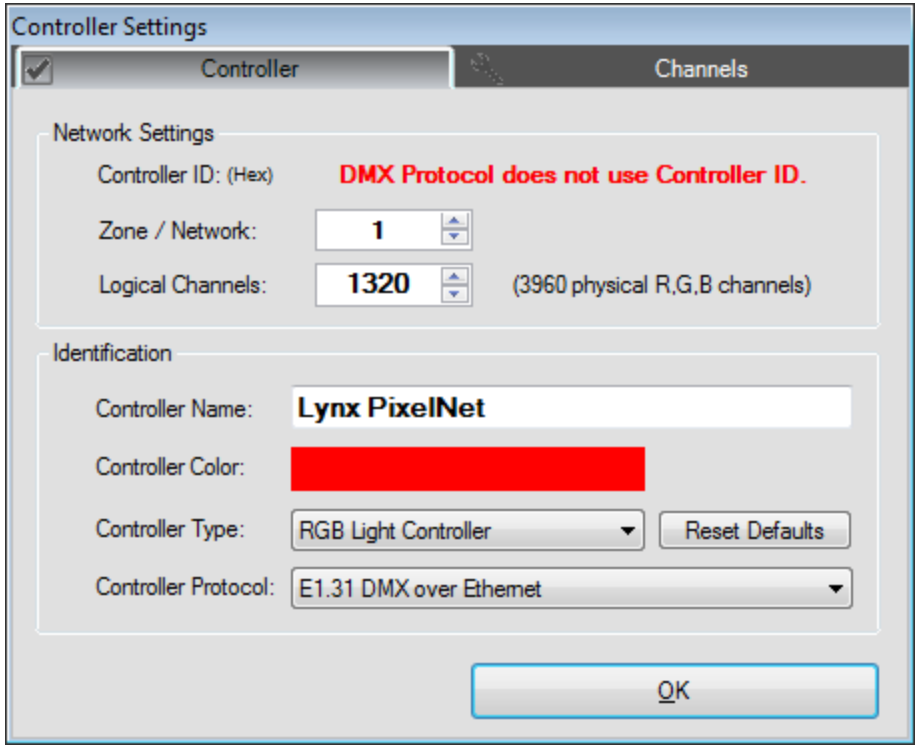
Sequencing Software

- Vixen
- LightShow Pro
- xLights

LSP 2.0 Setup

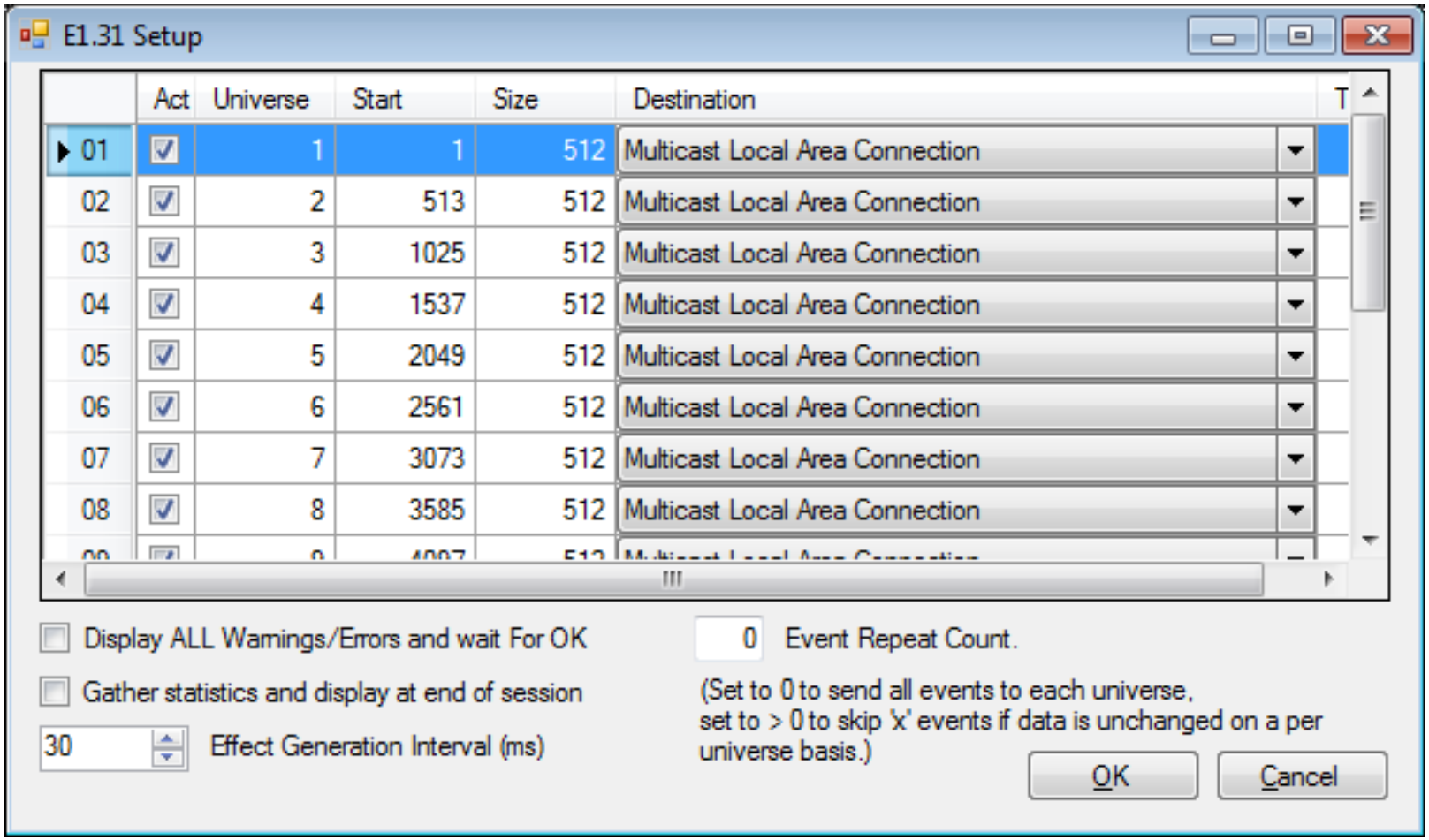


LOR Controller running DMX

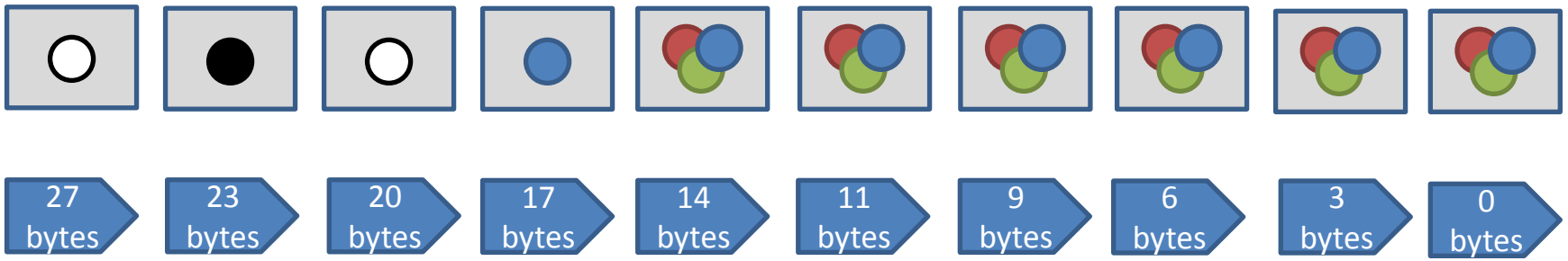


LOR Controller running PixelNet

E1.31 Setup


E1.31 Setup
Act
Universe
Start
Size
Destination
T
01 1 1 512 Multicast Local Area Connection
02 2 513 512 Multicast Local Area Connection
03 3 1025 512 Multicast Local Area Connection
04 4 1537 512 Multicast Local Area Connection
05 5 2049 512 Multicast Local Area Connection
06 6 2561 512 Multicast Local Area Connection
07 7 3073 512 Multicast Local Area Connection
08 8 3585 512 Multicast Local Area Connection
Display ALL Warnings/Errors and wait For OK
Gather statistics and display at end of session
30
Effect Generation Interval (ms)
0
Event Repeat Count.
(Set to 0 to send all events to each universe,
set to > 0 to skip 'x' events if data is unchanged on a per
universe basis.)
OK
Cancel

How Smart Strings work?



{255, 255,255} {0, 0,0} {255,255,255} {0,0 ,255} …

White
- Red = Dim level (255)
- Green = Dim level (255)
- Blue = Dim level (255)

First RGB reads first 3 bytes and passes the remaining bytes to the next RGB light. Repeat for the entire string.

Recommendations

- Use xLights test to validate setup
  - Keep it simple
- Use Conductor or xLights for scheduling shows
- Use EtherDongle for better performance
- Use refresh rate of 50ms
- Water protect SSC and Cat5 Connectors
- Know your power requirements

Shopping List

Item	Store
Cat5 Cables	Monoprice.com
Power Supply	Newegg.com
PVC pipe and Caps	Lowes / Home Depot
Marine Battery Case	Walmart
4 Wire Connectors (optional)	Ray Wu
4 conductor wire (optional)	Ray Wu