Astrolite NeoPixel Upgrade

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https://learn.adafruit.com/astrolite-neopixel-upgrade

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Overview

In this project we're upcycling a classic construction kit from 1969.

Astrolite by Hasbro, introduced in 1969, was a building toy set made of clear tubes that snap fit together, allowing one to build cities or robots of light!

In this project we're adding NeoPixels and motorizing the color wheel.

The Adafruit CRICKIT is great for this project, it can drive NeoPixels, servos and lots of other sensors and components for building robots.

The board and components fit inside the light box and secured with 3d printed parts.

All of the components stack on top of each other, making this an easy mod!
The 3d files are free to download and modify in any CAD package!

Program the Crickit and Circuit Playground Express with Microsoft Makecode or Circuit Python (https://adafruit.it/DGd). Use the onboard sensors to trigger drivers, motors, change light animations and sounds.

Add our polycarbonate case to a couple of Circuit Playground Expresses to add even more interactive lights! We 3d printed ¼ tripod attachments to fit with the tubes!

Prerequisite Guides

There's resources in these guides that go beyond what's covered in this tutorial. MakeCode guide is all about setting up your Circuit Playground Express board. The Circuit Playground Express introduction guide walks you through all of the pinouts, sensors and everything you need to know.

- MakeCode for Circuit Playground Express (https://adafruit.it/wWd)
- Introducing Circuit Playground Express (https://adafruit.it/adafruit-cpx)
- Introducing CRICKIT (https://adafruit.it/BD7)

Parts

You can find the list of all parts used to make this project linked below!
Adafruit CRICKIT for Circuit Playground Express
Sometimes we wonder if robotics engineers ever watch movies. If they did, they'd know that making robots into slaves always ends up in a robot rebellion. Why even go down that...
https://www.adafruit.com/product/3093

Circuit Playground Express
Circuit Playground Express is the next step towards a perfect introduction to electronics and programming. We've taken the original Circuit Playground Classic and...
https://www.adafruit.com/product/3333

Adafruit NeoPixel LED Side Light Strip - Black 120 LED
Fancy new side light LED strips are a great alternative for folks who have loved and used Adafruit LED strips for a few years but want gorgeous, glowy light emitting at...
https://www.adafruit.com/product/3634

Adafruit Circuit Playground Express or Bluefruit Enclosure
We've got nice cases for many of our beloved boards, but the Circuit Playground Express and
https://www.adafruit.com/product/3915
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**Standoffs**

- (4) M3x15mm secures Crickit to the 3D Printed Base
- CPX Servo Mount screws
  - (2) M3x6mm
- Servo Standoffs
  - (4) M3x10mm
- Servo Horn Standoffs
  - (2) M3x25mm

**Circuit Diagram**

Take a moment to review the components in the circuit diagram. This illustration is meant for referencing wired connections - The length of wire, position and size of components are not exact.
Connections:

Servo:

The servo plugs into the headers with the ground positioned close to the center of the board.

Side Light NeoPixel Strip:

The Side Light NeoPixel strip connects to the NeoPixel terminal on the Crickit. Din on the NeoPixel strip connects to the arrow icon on the terminal on the Crickit on the Crickit. GND connects to GND and 5V to 5V.

Battery Pack

The 4xAA battery case connects to the Power input on the Crickit. We added an on and off push button in between the battery pack and the barrel. We used a JST 2-pin Extension Cable with On/Off Switch - JST PH2 (https://adafruit.it/sPa) but any on / off switch will work.
Side Light Neopixel Strip Direction

Double check that the cables are connected at the start on the strip!

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**Code**

**MakeCode for CRICKIT and Circuit Playground Express**

MakeCode is this programming editor that runs in the Google Chrome web browser. It’s has an intuitive interface that’s both block based and text editor.

It works with Adafruit's CRICKIT and Circuit Playground Express so you can make interactive projects with the on-board sensors and components. You can drag & drop blocks to make interactive programs using lights and sounds without having to solder or learning a new syntax.

You can alternatively upload code directly to the Circuit Playground Express with WebUSB, [see the steps to do so here](https://adafruit.it/CLO).
Setup Circuit Playground Express for MakeCode

To get started, we'll need to head over to the Adafruit MakeCode (https://adafru.it/Bct) website and follow the steps below.

1. Plug in your Circuit Playground Express with a USB Cable
2. Press the RESET button. Green light means you're ready to MakeCode
3. Download the UF2 file and drop it onto CPLAYBOOT.

Install CRICKIT Extension for MakeCode

On the MakeCode.Adafruit.Com (https://adafru.it/DGm) site, click on New Project. In the list of blocks, select ADVANCED and then EXTENSIONS. Click on the Crickit block that shows up and install Crickit support! You will now have a new CRICKIT bin of blocks you can use!
Continue on to learn how to use these blocks. Read the full guide here for more info (https://adafru.it/BKC).

Upload and Test Code

Once you have your CPX setup with the MakeCode UF2, try testing it out by uploading the code to the board. Click the link below to open up the program in MakeCode. Click on the pink edit icon near the top of the title to open the code. This will create a project in MakeCode and allow you to edit, modify and upload the code to the board.

WebUSB

Makecode can also pair with your Circuit Playground Express through a chrome web browser by following this page in our MakeCode guide (https://adafru.it/CLO).

Open the project: https://makecode.com/_WhgMsj9Ea57X (https://adafru.it/DGn)

With WebUSB, the code edit will upload directly to the Circuit Playground Express without the need to drag and drop file onto it!

Follow the instruction to set up your board and you'll be able to quickly send code to Circuit Playground Express!

3D Printing

What If I Don't Have A 3D Printer?

Not to worry! You can use a 3D printing service such as a local 3D printer operator 3D print and ship you parts to you. This is a great way to get your parts 3D printed by local makers. You could also try checking out your local Library or search for a Maker Space.
Download STLs
https://adafruit.it/DH6

Edit Design

The design is modeled in Autodesk Fusion 360 and available to edit. You can adjust the pieces to print by moving or adding construction planes to cut up the parts. You can modify the sketches or adjust features in the parametric timeline.

Edit Servo Mount, Horn and CPX Mount Fusion 360 Files
https://adafruit.it/DGo

Edit Tripod Adapter, AdaStar Shape and Pegs
https://adafruit.it/DGp

Slice Settings

Depending on your 3D printer, you may need to adjust the slice settings. We printed all of the parts on a Prusa i3 MK2s. These parts were sliced with Ultimaker Cura.

- Nozzle: 0.4mm
- Extrusion Width: 0.4mm
- Layer Height: 0.15mm
Design Source Files

The enclosure assembly was designed in Fusion 360. This can be downloaded in different formats like STEP, SAT and more. Electronic components like the board, displays, connectors and more can be downloaded from our Fusion 360 CAD parts github repo (https://adafruit.it/AW8).

Assembly

Remove Light socket

We started by gutting the light bulb socket using a rotary tool and pliers.

Use the Dremel to remove a center black section and then use the pliers to grip the edges and pray off.
Base Plate

The 3D Printed Base plate will attach our Crickit with standoffs. The Base plate will press fits onto the bottom of the original Astrolite case and holds without the need of any additional hardware!

We'll use the (4) M3x15mm standoffs to attach the Crickit to the 3d Printed base.

CPX mounts

Next we'll assemble the included blot kit to the Circuit Playground Express.

The 3D Printed Servo Mount attaches to the Circuit Playground Express. Align the cutaway over the JST port.

Use two M3x6mm long screws to secure the Servo mount to the Circuit Playground Express.
Mount to Crickit

Now we can go ahead and secure the Circuit Playground Express to the Crickit (https://adafrui.it/CKF).

The printed Servo Holder will attach to the printed Servo Mount on the Circuit Playground via (4) M3x10mm standoffs.

Servo Holder

Position the printed Servo Holder so the slot for the cable is aligned with the power jack. Fasten the Servo Holder with (4) M3x6mm screws.

Align the cable on the Continuous Servo and press fit into the holder.

Side NeoPixel Strip

The Side Light Neopixel Strips are angled 90 degrees and allow the maximum amount of light into the tubes. Check the direction of the strip and connect to the Neopixel terminal on the Crickit.
Servo horn

The Servo Horn engages the color wheel by inserting two 25mm long standoffs into the circular hole pattern on the color wheel.

Press fit the horn onto the servos shaft. You can secure it further with one of the include servo horn screws.

Mount Components

Our AA battery pack fits inside the base, off to one side of the corners. We can secure it with double stick foam tape.

Pass the toggle on/off switch through the light socket opening.
Position Strip

Loop the Side Light Neopixel strip around the center of the case.

Platform Standoffs

To elevate the base and provide more clearance, additional standoffs are added to the corners. We used (4) M3x10mm standoffs with M3x6mm screws.

This allows the color wheel to spin freely without catching the edges.
Attach Platform

And that's it! Once the platform is elevated on each corner, the platform simplify fits on top of the case.

We can peak through the side of the case to verify if the servo horn standoffs fit into the color wheel by hand turn until the hole fall into place.

CPX Case

Our crystal clear acrylic case for the CPX is a really nice companion.

We used a mix of tripod screws and 3d printed bits so we can work it into the astrolite kit.

The Adafruit CRICKIT has lots of IO so it's easy to add more components like speakers for audio and sound effects.