Assembly Instructions

ACP3 Common Controller
Standard Configuration with Housing

(Assembly ACP3-X-CTL)

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1.0 Introduction and Scope

The purpose of this guide is to help the reader assemble and begin using the ACP3 common controller for *Artemis Spaceship Bridge Simulator* (Artemis SBS). This controller, when used in conjunction with compatible custom control panels, allows the Artemis SBS game to be controlled with themed hardware that may emulate popular or fanciful notions of sci-fi spaceship controls. The function of the controller is to convert inputs from these various controls into USB mouse and keyboard commands that the Artemis SBS software will recognize. This controller is not required to play Artemis SBS. However, some people may find the inclusion of this optional hardware enhances the gameplay experience.

This guide assumes that the reader has a functional Windows PC[1] and Artemis SBS host software configured to play one of the various bridge stations. This guide assumes that the reader has all of the ACP3-X-CTL kit parts as well as the tools and supplies outlined in Section 3.0. This guide also assumes that the reader is skilled in the use of the recommended tools. The appearance and quality of the assembled kit will depend on the skill and diligence of the reader in carefully assembling the parts using these tools and supplies.

This guide contains information useful for the following purposes:

- Careful handling and preservation of the kit parts to ensure future control panel functionality (Section 2.0)
- Kit part inventory and gathering of recommended tools and supplies for assembly (Section 3.0)
- Recommended steps to prepare and assemble the parts for use (Section 4.0)
- Setting up an ACP3 control system to enable use playing Artemis SBS (Section 5.0)
- Updating controller software to improve control panel performance and functionality (Section 6.0)
- Troubleshooting common problems using the control panel (Section 7.0)

[1] while other operating systems and hardware may support Artemis SBS, the author has no experience with them

2.0 Important Information

The ACP3-X-CTL kit contains various components that are sensitive to physical and electrical damage. The following precautions are recommended to protect these components against damage that would prevent their intended use.

- when handling circuit boards and other electronic components, ground hands to mounting hardware or other connected non-electronic parts to prevent static discharge to electronic components
- when handling circuit boards, handle from board edges and avoid touching conductors (metal parts other than standoffs and screws)
- make sure all sources of electric power are disconnected from controller (assembly ACP3-X-CTL) when connecting or disconnecting cables
- avoid creasing or kinking wires and ribbon cables, which can cause them to fail
- do not apply external sources of electric power to controller other than the power provided by the USB connection to the PC. (Note that other configurations are possible. However, this is an advanced topic and not in the scope of this guide)
- do not hit or drop the acrylic housing on its edges or corners, which can lead to factures in the housing material

3.0 Kit Parts and Recommended Tools & Supplies

3.1 Items Required to Play Artemis SBS using ACP3-X-CTL

Item	Availability	Other Information
Artemis SBS software	online	https://artemisspaceshipbridge.com/
bridge station PC	various	needed to connect controller
other bridge station PCs and LAN network	various	needed to play game, refer to Artemis SBS documentation
ACP3 or ACP3-compatible control panels	from kits	https://www.etsy.com/shop/AORshipyard https://github.com/angelofrust/ACP3
USB micro-B to A cable	various, office supply	

3.2 ACP3-X-CTL Kit Contents

Item	Quantity	Other Information
4-40 screws	8	
3/8-inch standoffs	4	
controller board (ACP3-X-CTL-PCB)	1	
controller enclosure (ACP3-X-CTL-ENC)	1	acrylic, laser-etched

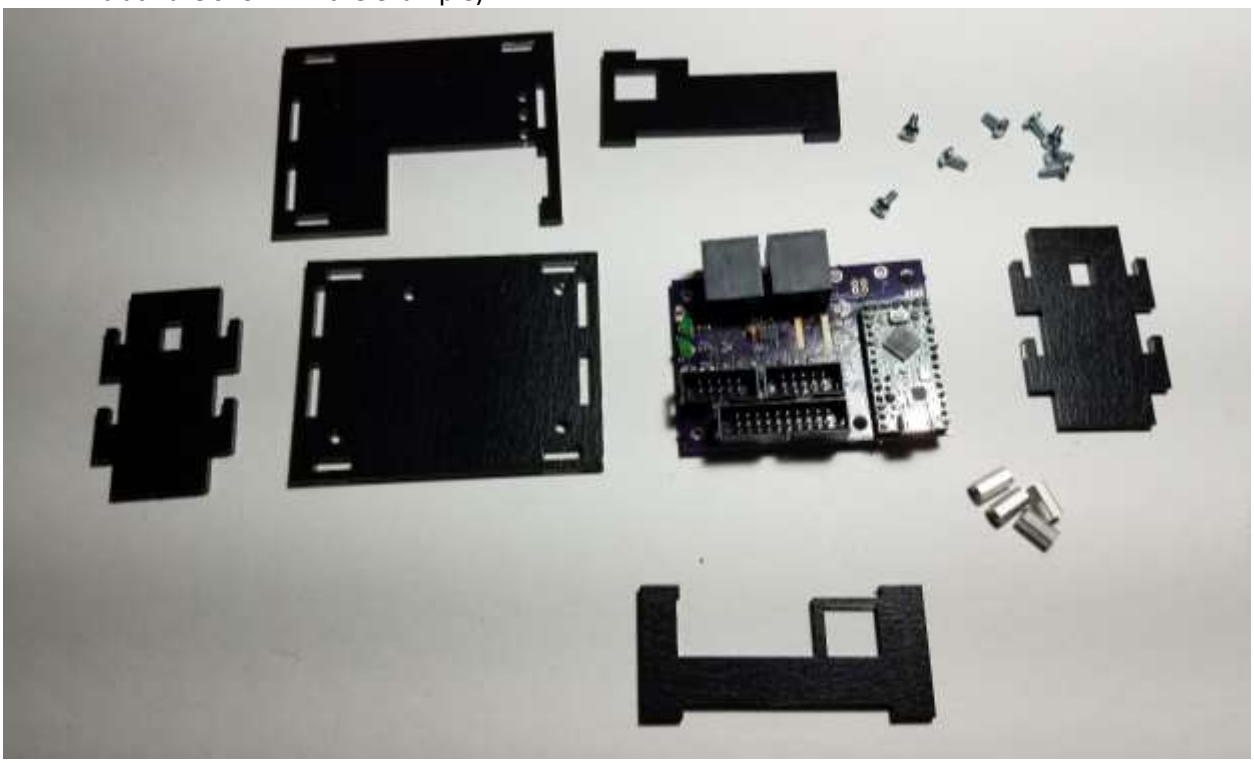
3.3 Recommended Tools and Supplies

Item	Availability	Other Information
small Philips-head screwdriver	hardware and home improvement stores	
hobby knife	hobby stores	
2- or 3-inch foam paint roller	hardware and home improvement stores	optional
multi-surface acrylic craft paint	hobby stores	optional – choose color to suit taste

4.0 Assembly Instructions

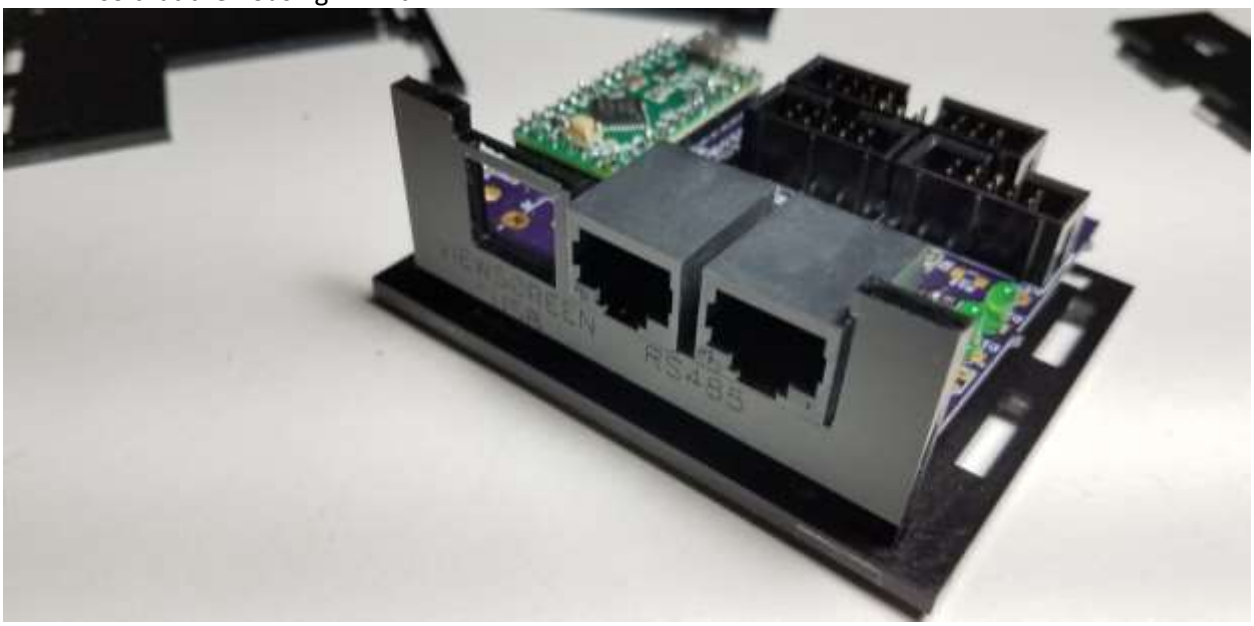
The following instructions address the assembly of the acrylic housing for the ACP3 controller. If followed in order, these steps should quickly enable the assembly of the controller housing. As long as the parts are undamaged, the housing can later be disassembled for painting or other modifications.

1. Assemble supplies. Remove paper backing from acrylic pieces. If desired, clear acrylic pieces can be painted on the back side using craft acrylic paint and a foam roller (acrylic pieces painted black are shown in the example):.

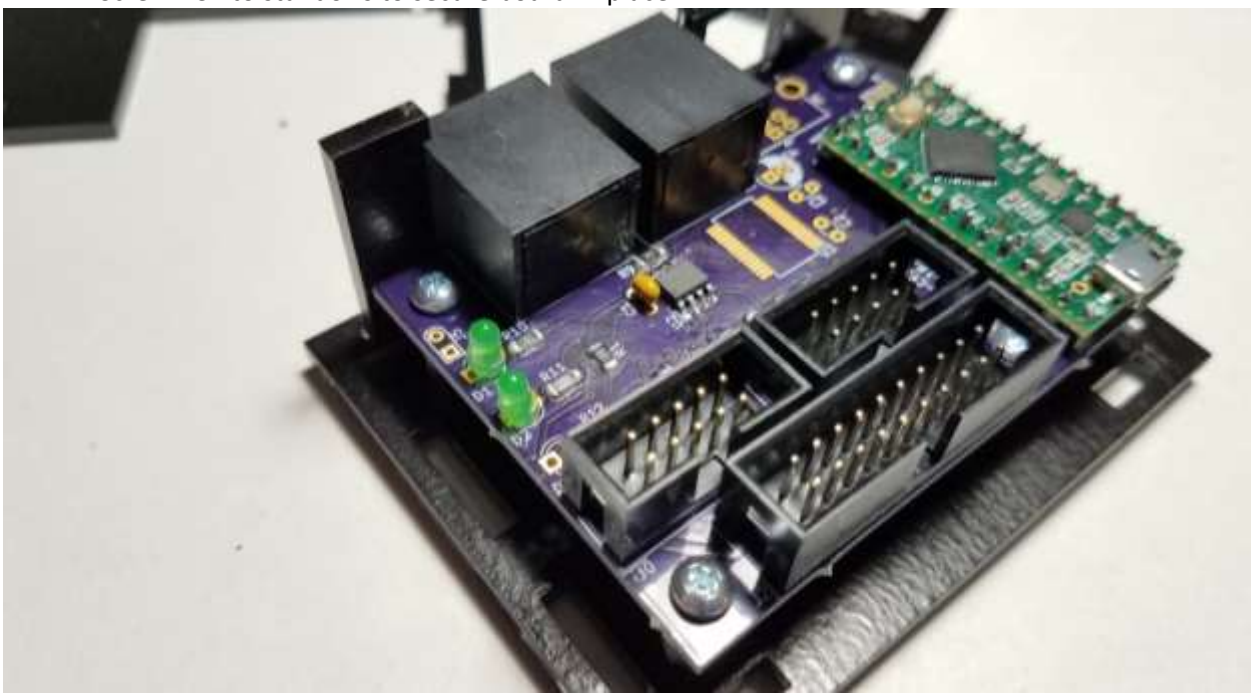


2. Screw standoffs to bottom plate using screws.

3. Insert bottom tabs of back plate into base plate and position PCB over standoffs, sticking RJ45 jacks through opening. Note: bumps on edges of PCB may need to be cut off using a hobby knife so that the housing will fit



4. Screw PCB to standoffs to secure board in-place.



5. Insert bottom tabs of front plate and side plates, making sure to position side plate cut-outs towards the back.

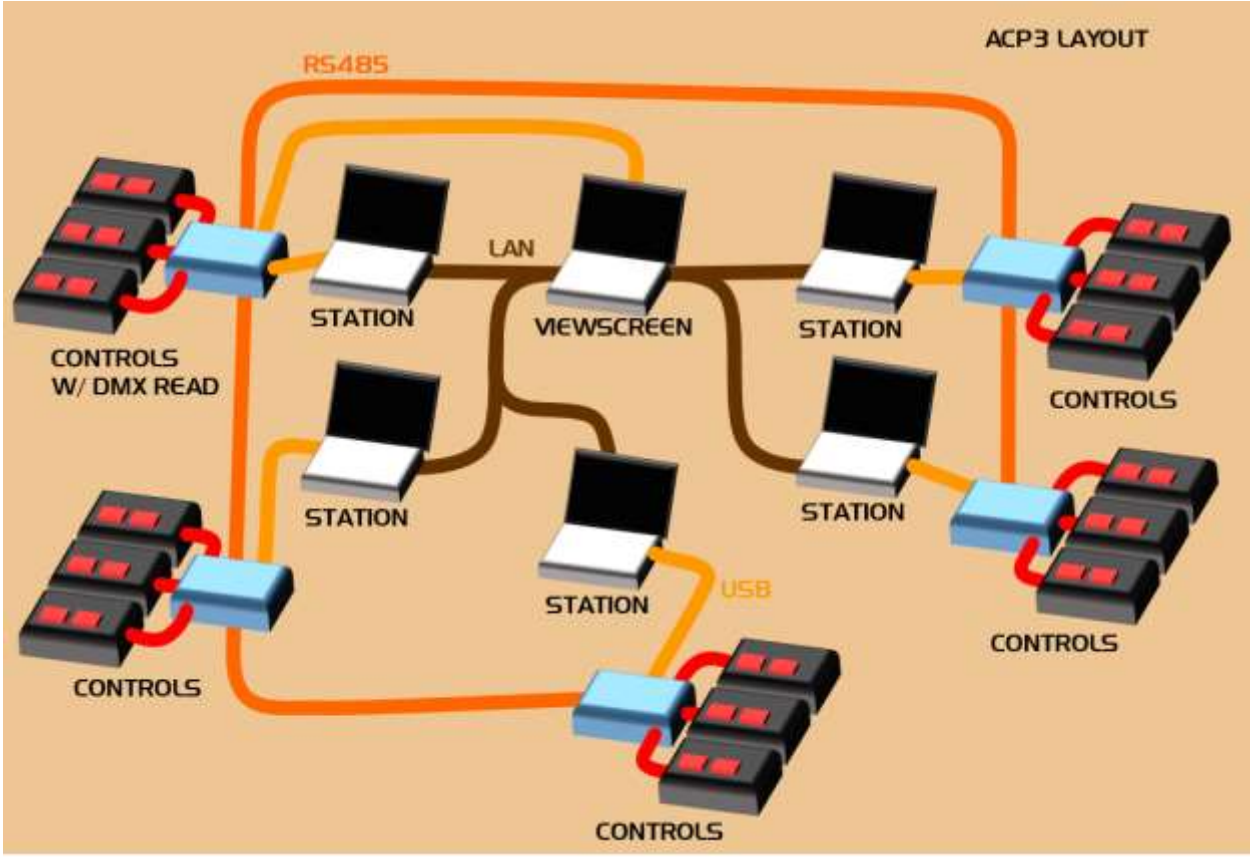
6. Place top plate over side plates, adjusting as necessary to allow all top tabs to slide through top openings.

7. Slide side plates towards back to lock in-place. Clear tape can be used to secure side plates if loose.

Assembled ACP3 Controllers with Optional Black Paint and Natural Clear Acrylic

5.0 Setup and Use

- The ACP3 common controller (ACP3-X-CTL) is designed to allow control of many different kinds of control panels for the various stations of Artemis SBS. The diagram below shows the general configuration of a completely populated and assembled ACP3 control system connected to networked Artemis SBS stations.

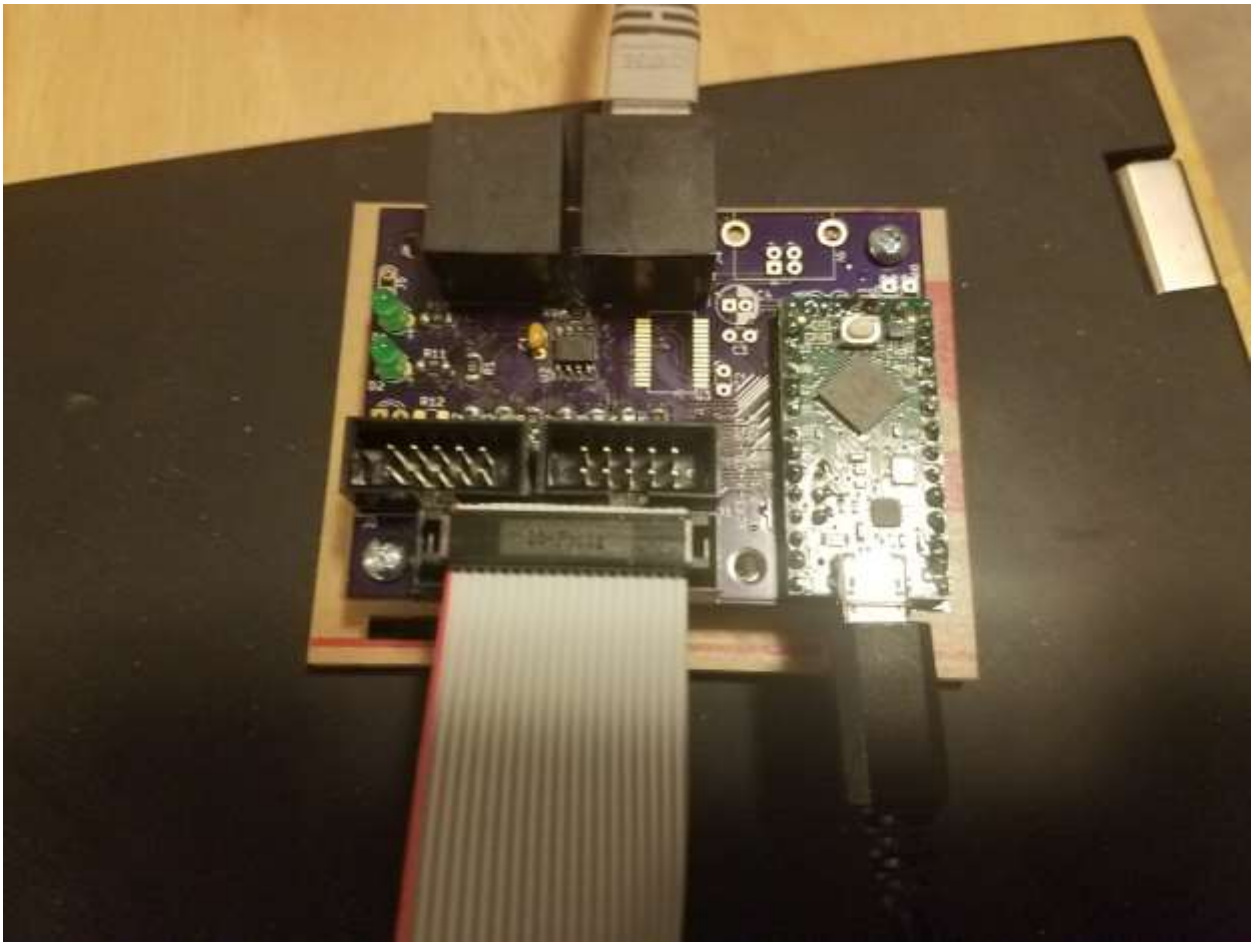


ACP3 control system schematic (blue: ACP3 controllers, black: control panels, red: ribbon cables, orange: ACP3 communication over cat5 (Ethernet) cables between controllers, yellow: USB connections to station PCs, brown: LAN connection between PCs)

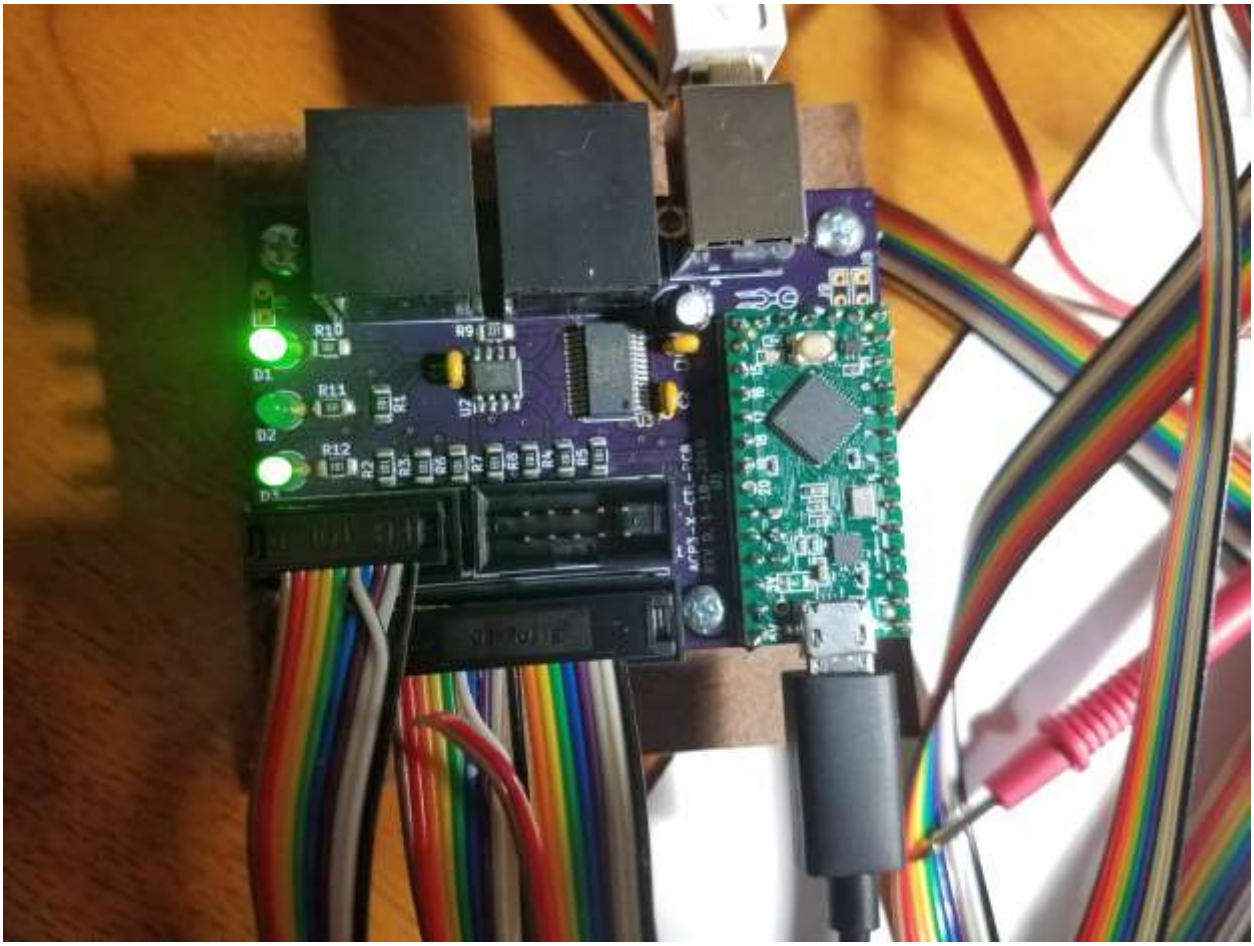
- The ACP3 common controllers can communicate with each other when connected via Ethernet cables plugged into the RJ45 jacks labelled “RS485” on the back of the controllers. To work correctly, these cables should be connected from one controller to the next “daisy chain” style. For that reason, each controller has two RJ45 jacks to allow it to be chained together with the other controllers.
- For communication to function between ACP3 controllers, exactly one controller must be programmed to function as a “master controller” so that communications are conducted orderly. More than one master controller will result in garbled communication. See Section 6.0 to download and update controller software.

- Even though ACP3 controllers use Ethernet cables for communication, the controllers themselves cannot communicate with other kinds of devices other than other ACP3 controllers using these cables. Connecting the ACP3 controller to a wired LAN will not work.
- ACP3 controllers connect to PCs via the micro-B USB jack on the front of the controller. To function correctly, the corresponding USB cable must be connected to a functioning PC. This connection is used for both power and communication with the connected PC. When connected and running the correct software, the ACP3 controller functions as a combination joystick/mouse/keyboard Human Interface Device (HID).
- Control panels are connected to the ACP3 controller using the shrouded pin headers on the top of the controller. Refer to individual control panel instructions for the installation and operation of connected ACP3 control panels.

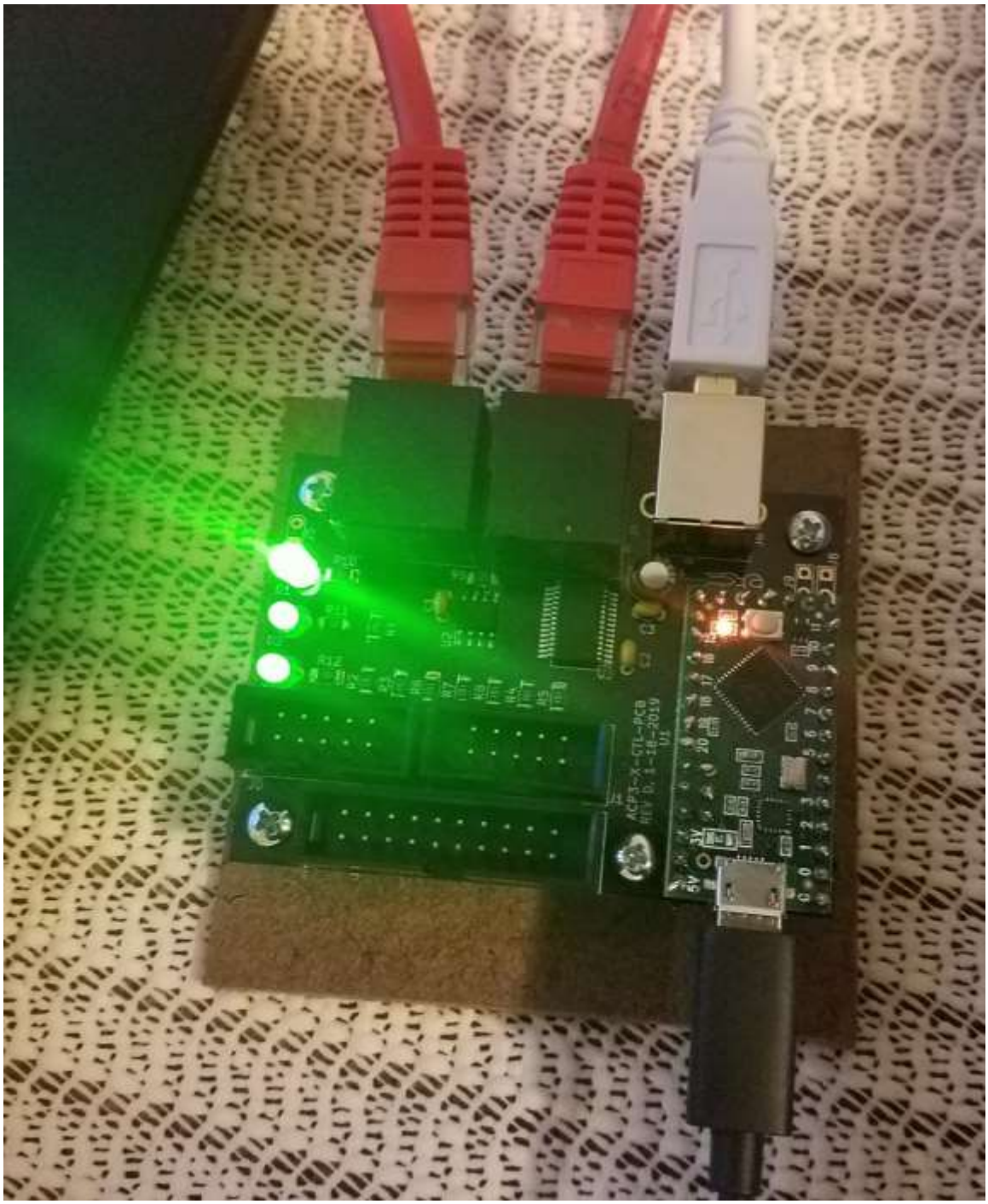
Standard ACP3 Controller Connected to one Control Panel and a PC



Standard ACP3 Controller Connected to one Control Panel, a PC, and the End of an RS485 Chain



DMX-Reader ACP3 Controller Connected to two Control Panels, a Client PC, and a Viewscreen PC



DMX-Reader ACP3 Controller Connected to a Client PC, a Viewscreen PC, and the Middle of an RS485 Chain

6.0 Updating Software

The ACP3 controller uses a programmable Teensy-LC microcontroller development board to accomplish most functions. To update the ACP3 software on the Teensy-LC, a micro-B USB cable connection to a PC running Arduino and Teensyduino is needed.

Arduino software: https://www.arduino.cc/en/Main/Software
Teensyduino software: https://www.pjrc.com/teensy/td_download.html

Install the above software following the instructions provided in the links. Once installed, the Arduino sketch (code) for various ACP3 control panels (files ending in ".ino") can be opened. These sketches are available here:

https://github.com/angelofrust/ACP3

Before compiling and uploading the sketch, make sure the following settings are selected in the Arduino software:

Tools > Board: "Teensy-LC"
Tools > USB Type: "Serial + Keyboard + Mouse + Joystick"

Once the sketch is loaded and the above settings are made, click Sketch > Upload to compile and upload to the controller. It is recommended to unplug the ribbon cable from the controller during this step because the engineering control program will make multiple click-and-drag mouse movements on the screen when booting with the control panel attached. These movements can make unexpected changes to the Arduino sketch on screen.

7.0 Troubleshooting (to be completed later)

Problem	Potential Cause	Solution