This system consists of 3 units playing sound and controlling light for the installation Suuret Muinaiset (Joel Steenros, Jesse Kitinoja).
In the installation, 3 concrete sculptures/creatures (LONG in green, SMALL in yellow and SEASHELL in red) communicate through sound and light.
The units were designed, built and program by Antoine Arthur Hureau.

Each unit consists of an IP rated enclosure containing a Teensy 4.0 microcontroller controlling different peripherals through a custom motherboard and the official Teensy Audio Shield, an audio amplifier and 2 power supply units. In addition, an outdoor rated speaker is with LED strip mounted on its grid are used emit sound and light. The Teensy MCU is programmed using the Arduino + Teensyduino frameworks and external libraries.

The 3 units comunicate via serial (Software Serial3, carried as a TTL signal over underground CAT6). The Serial implementation is rudimentary, 1 unit serving as a leader and 2 as followers. The leader unit (ID0 for LONG) sends the same commands to the follower units (ID1 for SMALL and ID2 for SEASHELL). Both followers can report to the leader unit when requested.

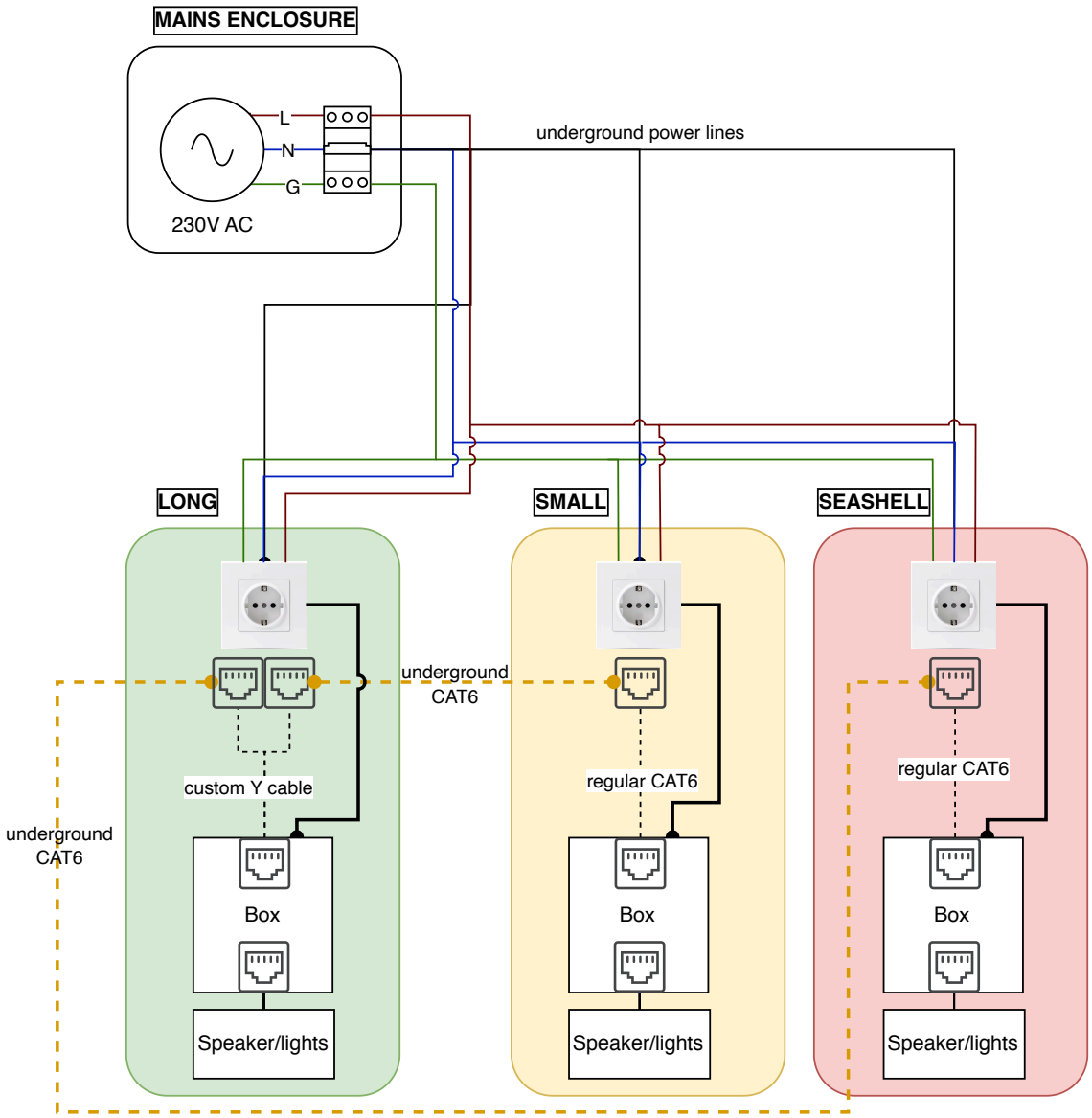
Each unit can be independantly controlled via Serial using a USB cable attached to each enclosure. When receiving USB commands, the leader unit will process then forward any command, while the follower units ill only process the commands locally. Each unit runs the same exact program, but depending on its identification, will behave as a leader or follower. The identification is hardware based, by connecting a voltage to specific pins of the Teensy.

The leader unit has a RTC module that puts the system to sleep each night, and wakes it up every morning (forwarding to follwer units).

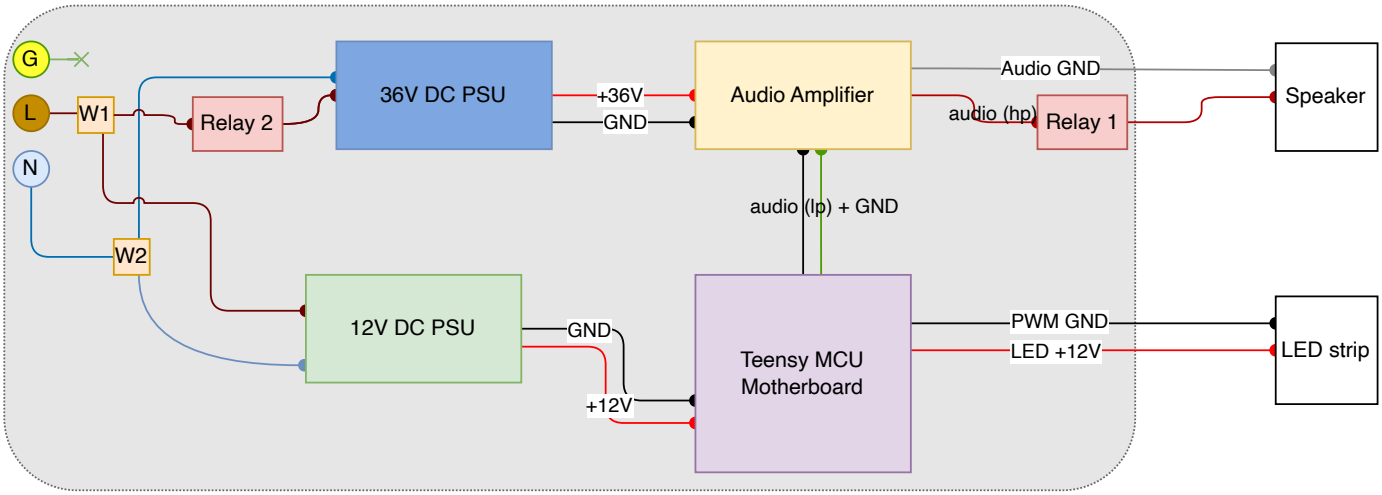
On each motherboard there is LED array that can display in binary any digit from 0 to 16. This is used to display system states and troubleshoot.

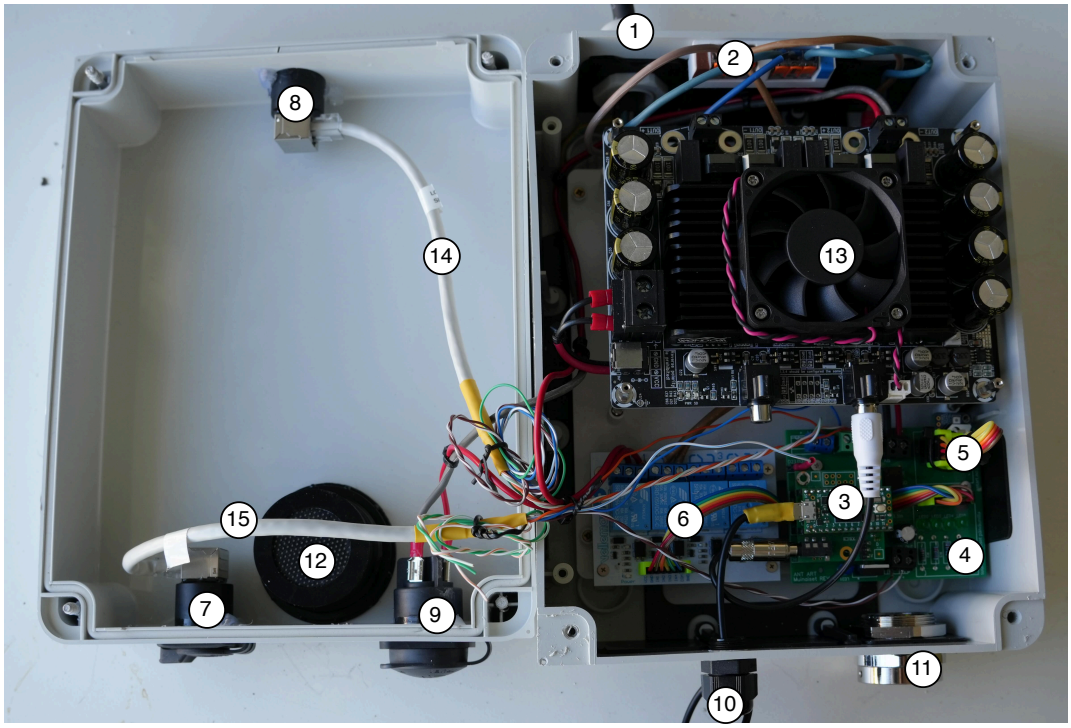
In the following pages, the units are detialed through various diagrams.

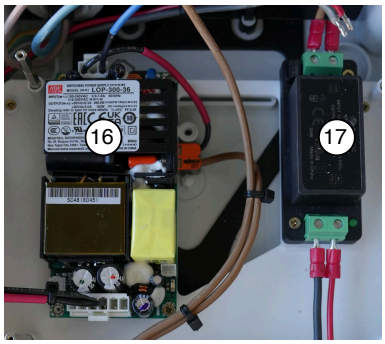
POWER AND NETWORK WIRING ON SITE



BLOCK DIAGRAM WIRING IN LONG / SMALL / SEASHELL



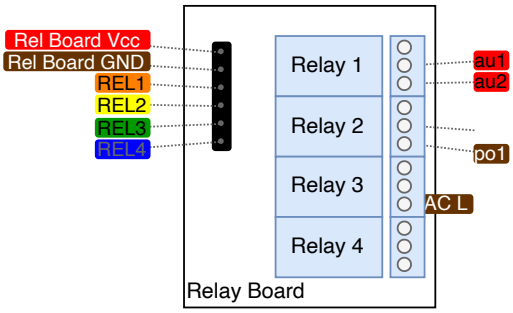


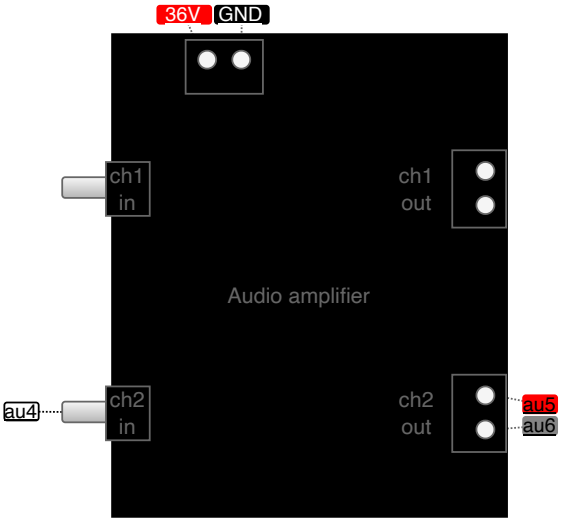


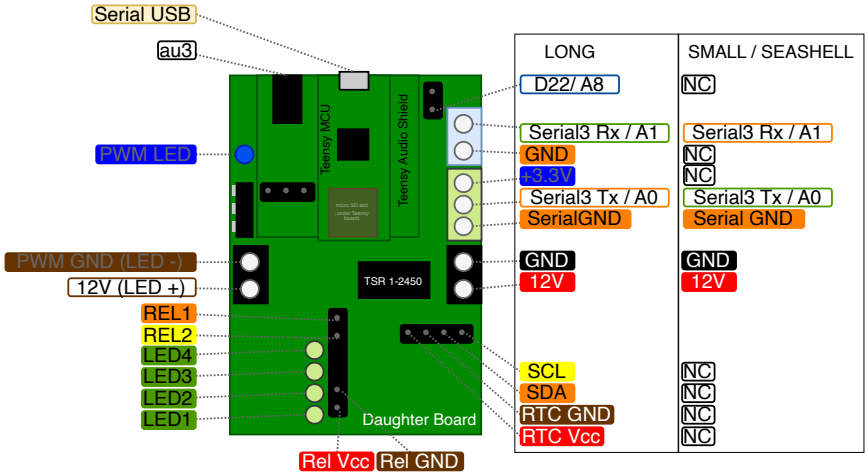
16. 220V AC to 36V DC PSU
17. 220V AC to 12V DC PSU

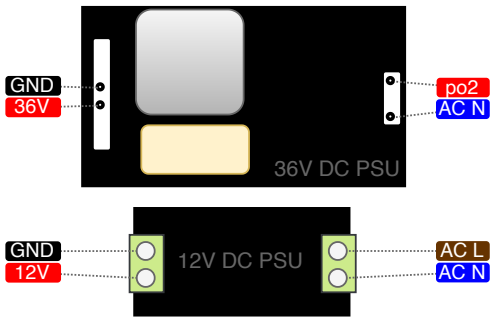
1. Main power input (220V AC)
2. Wagos for 220V AC distribution/splitting
3. Teensy 4.0 MCU
4. MCU Motherboard with different I/O and LED array
5. RTC module (LONG player only)
6. Relay board to switch certain connections on/off
7. EtherCON chassis connector serving as PWM output to LED strip
8. EtherCON chassis connector serving as a serial communication port
9. PowerCON chassis connector serving as audio output to speaker
10. USB Cable to upload code and communicate with the MCU
11. Pressure compensating vent to maintain stable pressure and temperature in unit
12. Sillica gel tank to absord humidity in unit
13. Dual channel 150W audio amplifier
14. CAT6 cable used to link motherboard to the chassis connector (Serial)
15. CAT6 cable used to link motherboard to the chassis connector (PWM)

PINOUT REFERENCES CHART









LEDs

- PWM LED — PWM status
- LED4, LED3, LED2, LED1 — array for system status

Audio Connections

- au1 — Relay 1 input (from Amplifier out +)
- au2 — Relay 1 output (to Speaker +)
- au3 — MCU output (minijcak)
- au4 — Amplifier input (RCA)
- au5 — Amplifier out +
- au6 — Audio GND(Amplifier out -)

Serial LONG

- Serial3 Rx / A1 — Serial3 receive
- Serial3 Tx / A0 — Serial3 transmit

Serial SMALL/SEASHELL

- Serial3 Tx / A0 — Serial3 transmit
- Serial3 Rx / A1 — Serial3 receive

Power AC

- AC L — 220V AC Line
- AC N — 220V AC Neutral
- po1 — Relay 2 output (to 36V DC PSU)
- po2 — 220V AC Line for 36V DC PSU (from Relay 2)

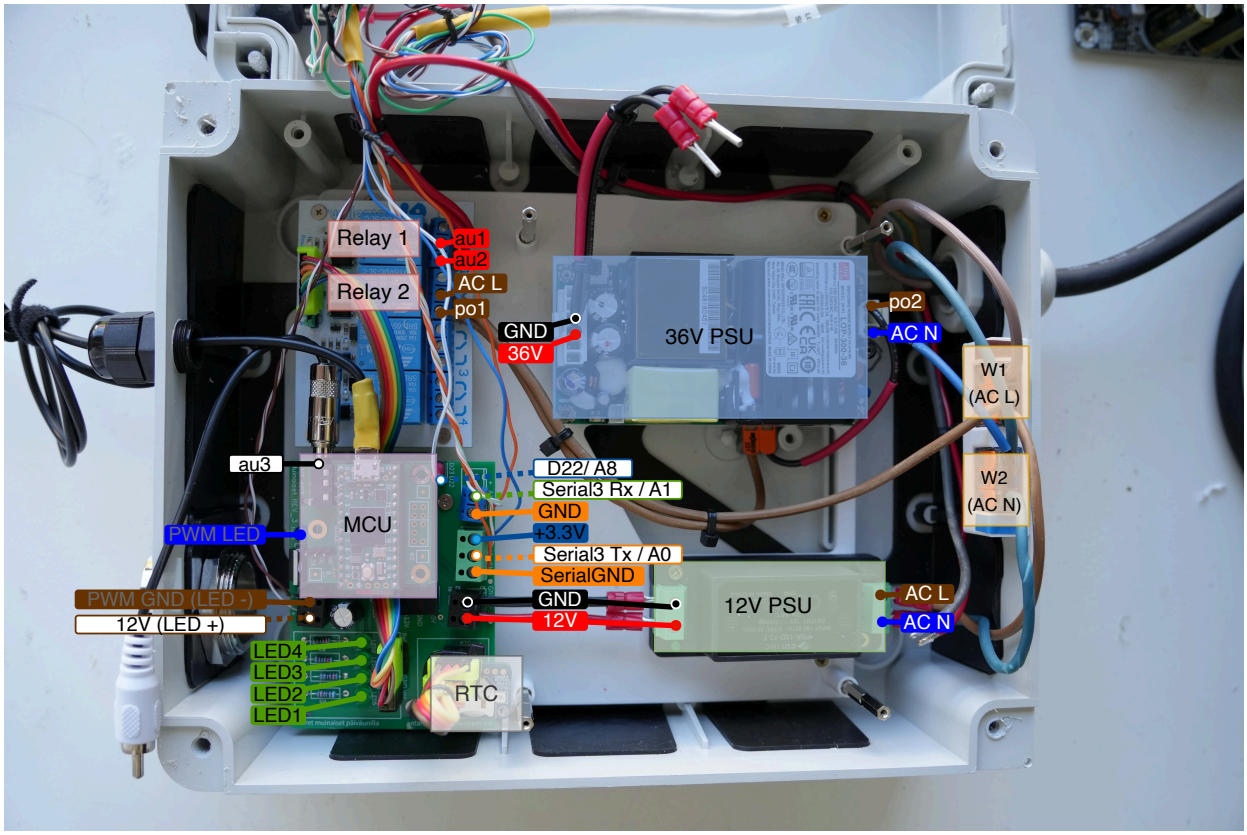
Power DC

- 12V — +12V DC
- 36V — +36V DC
- GND — 0V DC / Ground ref
- PWM GND (LED -) — PWM 0V DC / LED -
- 12V (LED +) — +12V DC / LED +
- Serial GND — 0V DC / Serial3 Ground ref

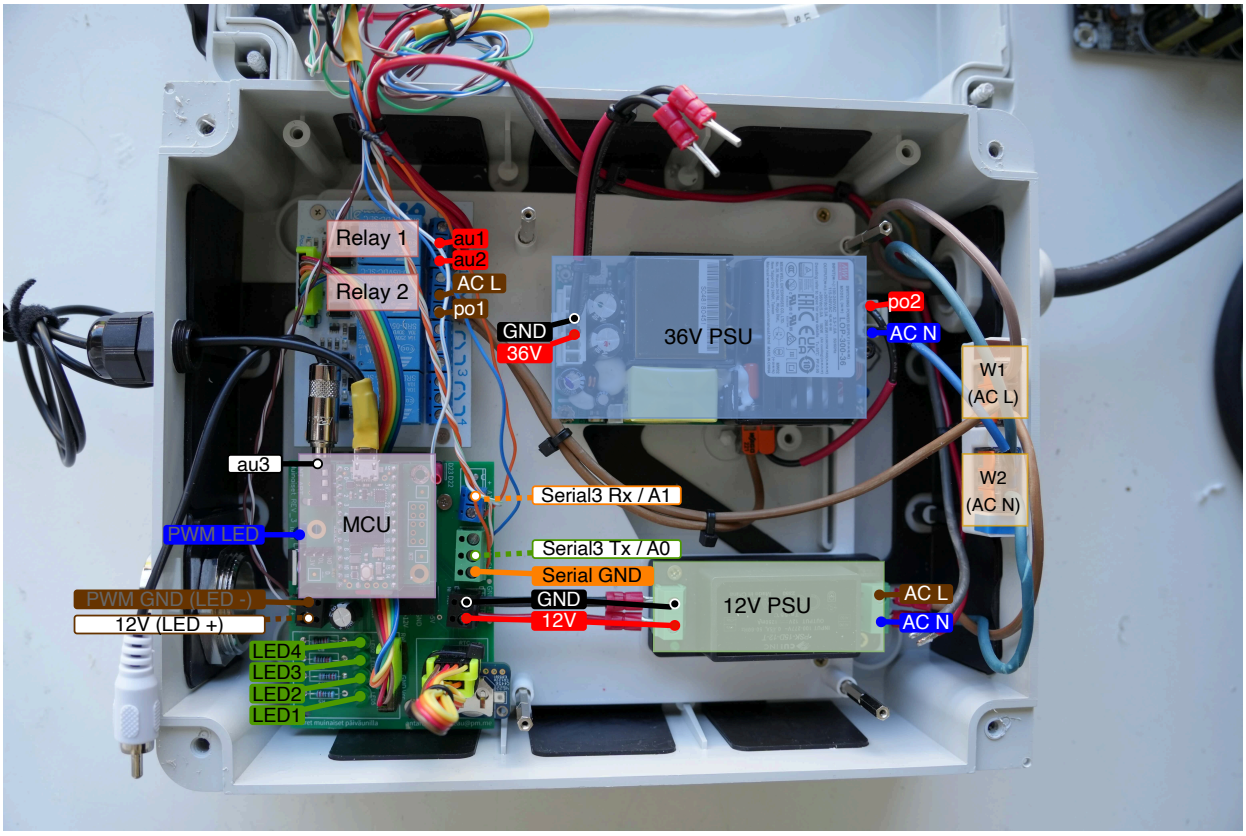
Volume control LONG

- D22/ A8 — Volume pot analog input
- +3.3V — +3.3V DC to volume pot
- GND — 0V DC / Ground ref

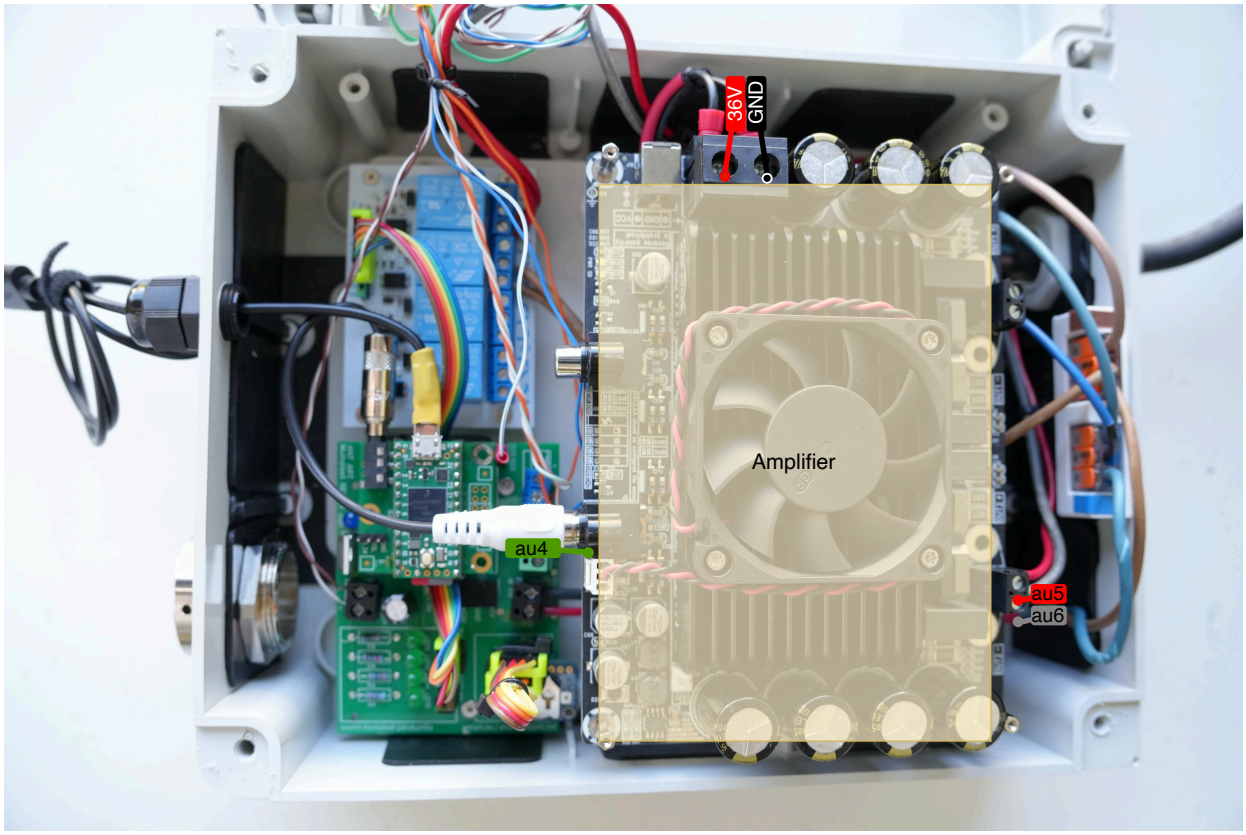
LONG PINOUT



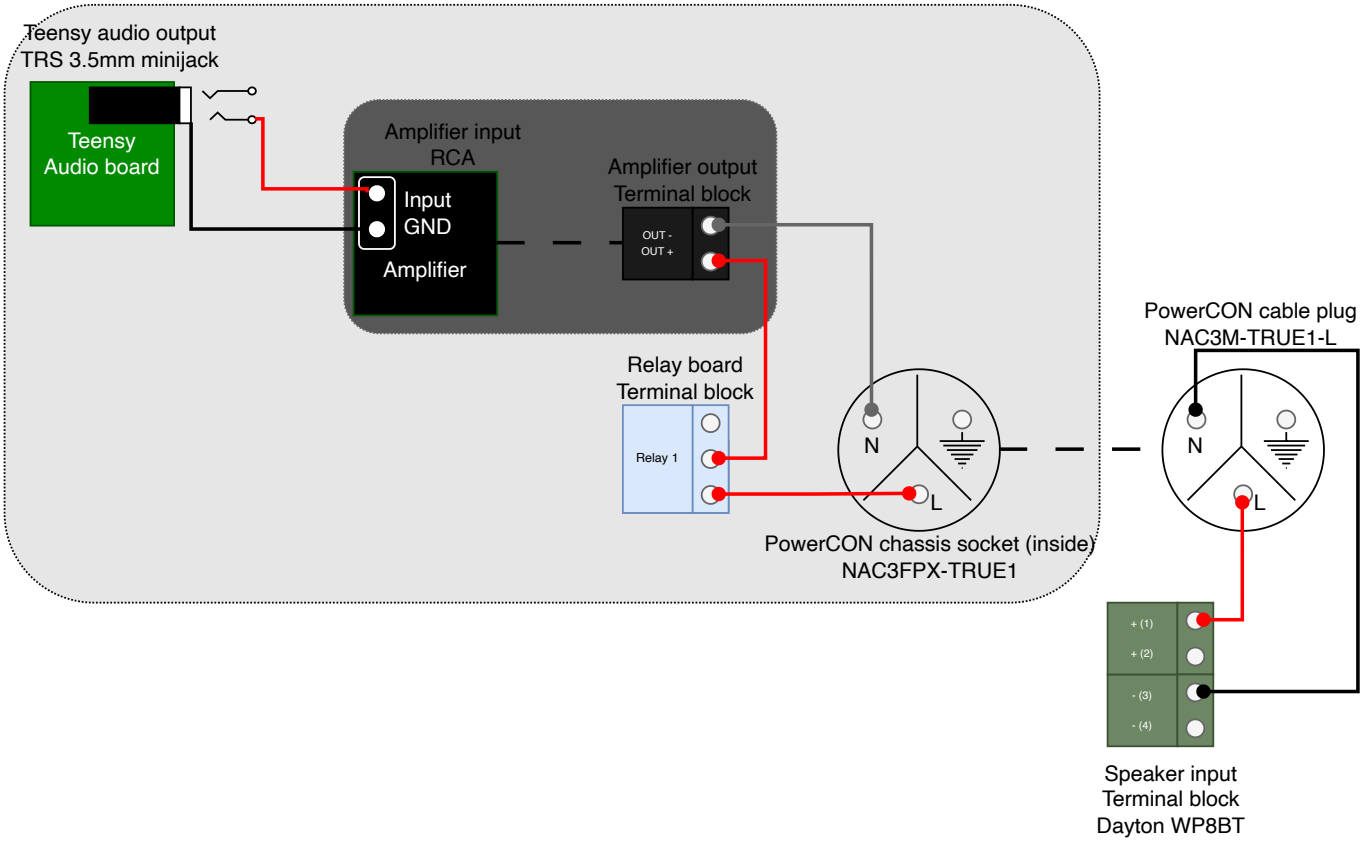
SMALL / SEASHELL PINOUT



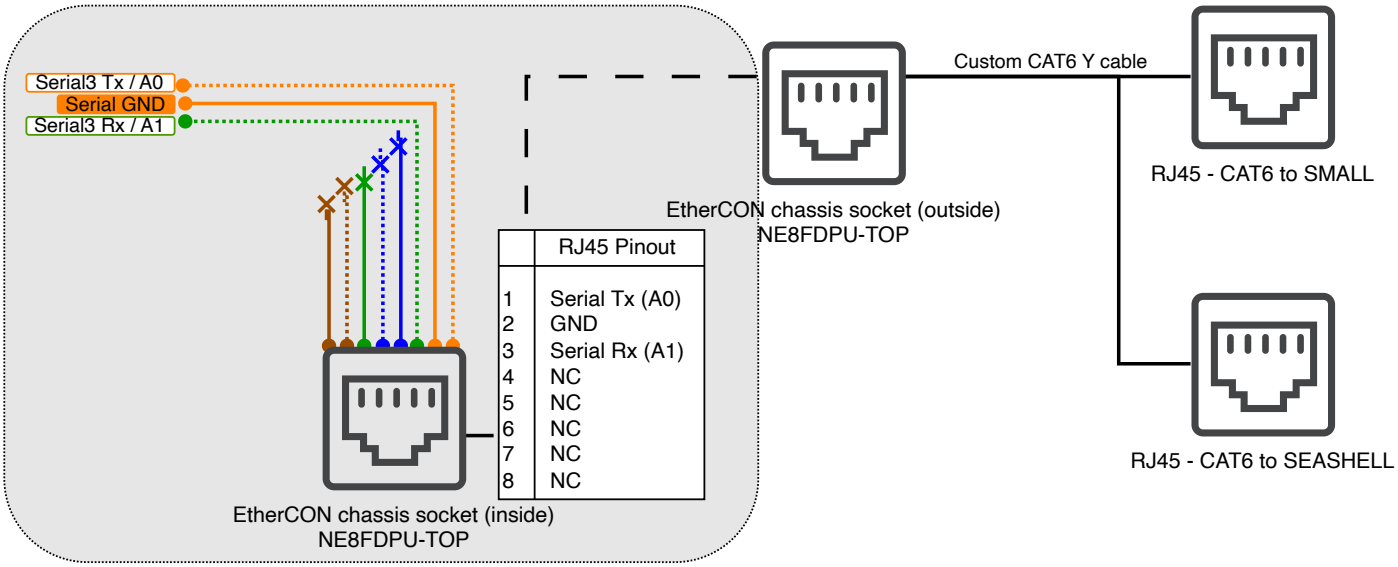
LONG/SMALL / SEASHELL AMPLIFIER PINOUT



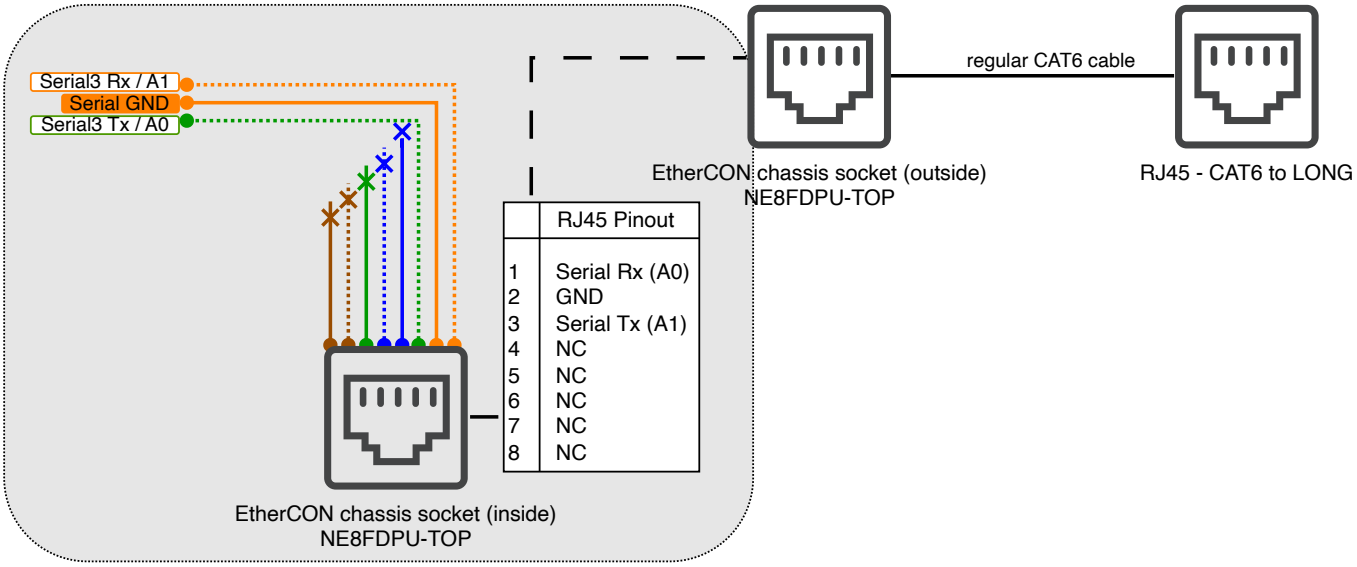
LONG / SMALL / SEASHELL - AUDIO SIGNAL CHAIN



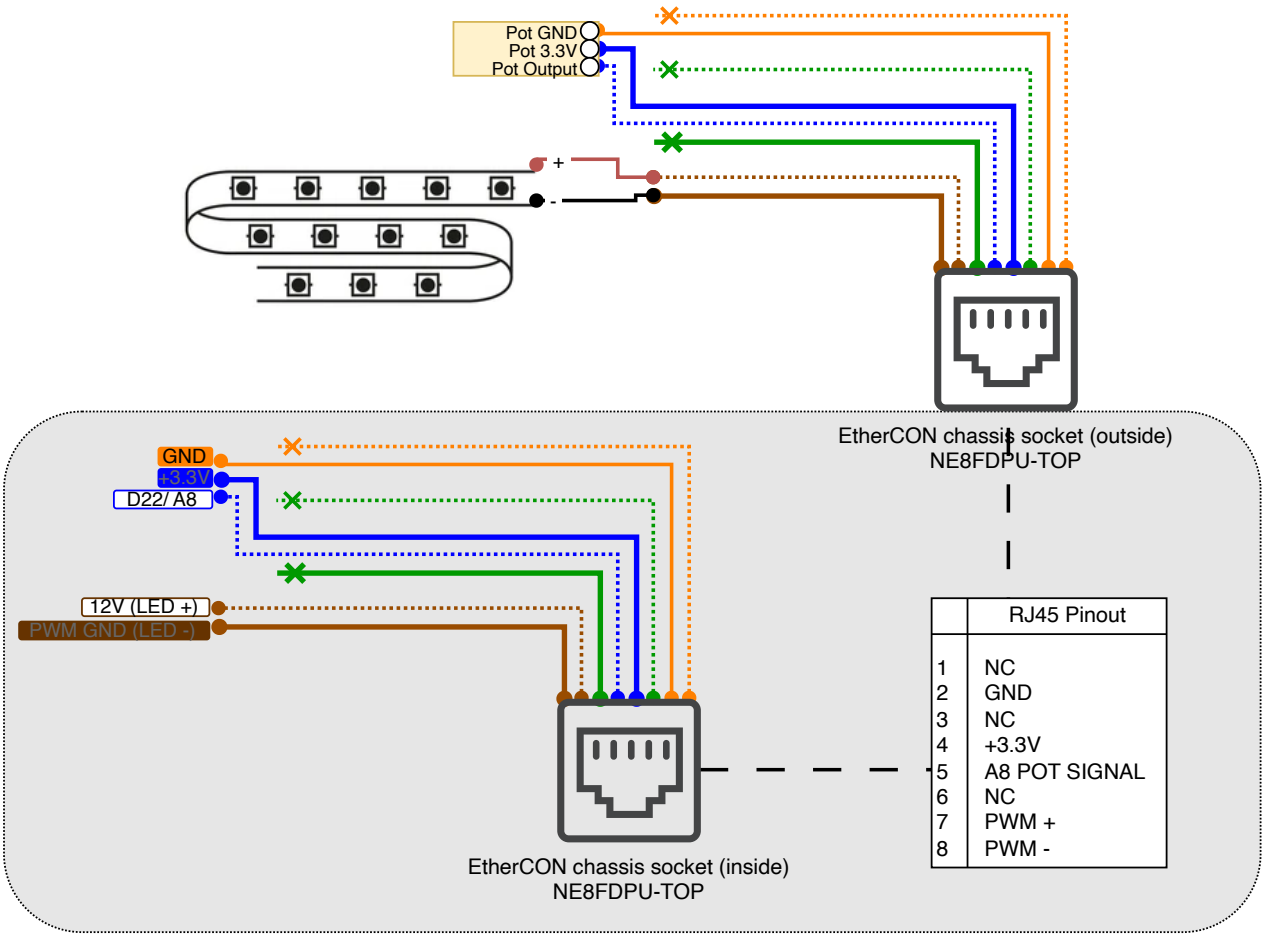
LONG - SERIAL WIRING



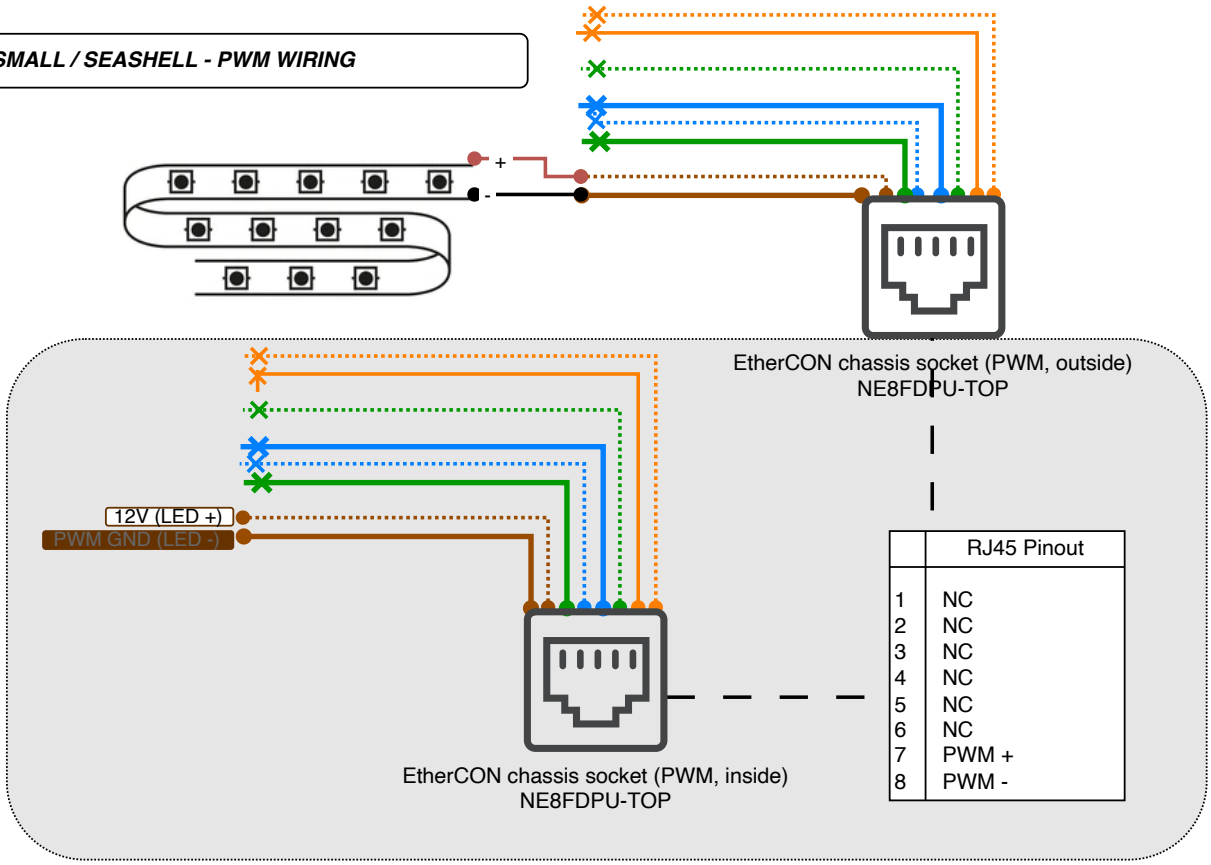
SMALL / SEASHELL - SERIAL WIRING



LONG - PWM / VOLUME CTRL WIRING

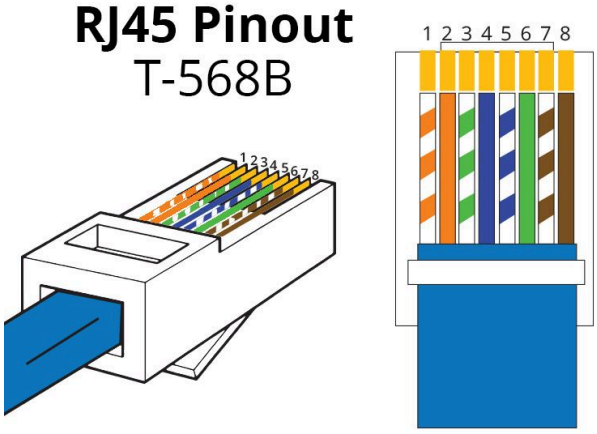


SMALL / SEASHELL - PWM WIRING



REFERENCES

RJ45 Pinout
T-568B



1. White Orange	5. White Blue
2. Orange	6. Green
3. White Green	7. White Brown
4. Blue	8. Brown

TRS 3.5 minijack pinout