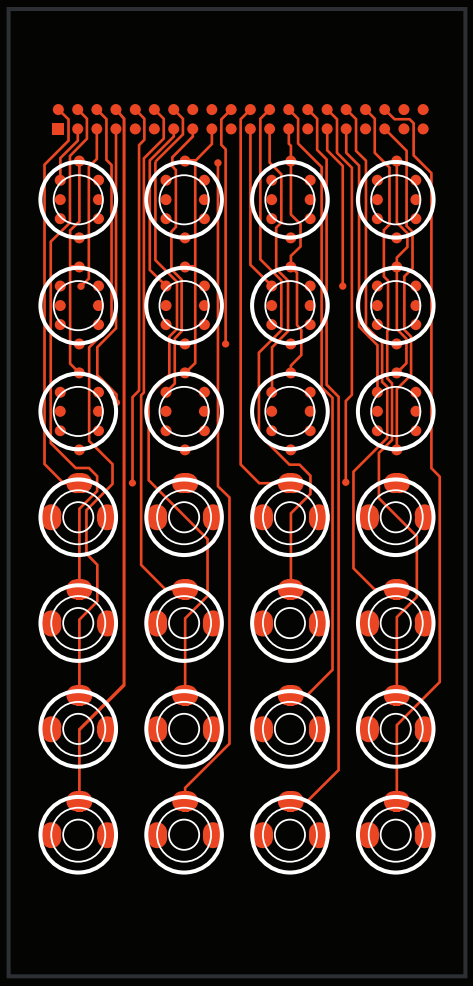

# ALGORHYTHM

*Programmable gate sequencer*
*with probabilistic randomization*

## DIY BUILD GUIDE

**GRAYSCALE**

*http://grayscale.info*

# **ALGORHYTHM** DIY BUILD GUIDE

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Algorhythm is a microcontroller-based module for generating logic signals that can be organized into musically meaningful patterns. Although it can be used as a simple 8-step trigger sequencer, the combination of pulse outputs for each step, voltage-controlled randomization, customizable settings, and self-patching possibilities create a self-contained system with extensive options for generating unpredictable rhythms.

The DIY kit for Algorhythm is relatively easy to build. The project requires soldering 16 jacks, 12 LED switches, and one 40-pin header onto the bare panel PCB. The main PCB is supplied with all surface-mount components already installed, providing for full electronic testing of the main circuits and pre-installation of the latest firmware.

## Technical Details

**In the box:**

- Aluminum front panel
- Panel PCB
- Pre-tested SMD subassembly with firmware preinstalled
- Panel hardware: 16 jacks, 12 switches, 40-pin header (all through-hole)
- Power cable (10-to-16 pin)
- Link cable (8-to-8 pin) for chaining multiple modules

**Dimensions:**

- Height: 3U (5.06” or 128.5mm)
- Width: 6hp (1.2” or 30mm)
- Depth: 30mm (with power cable installed)

**Power Requirements:**

- Maximum of 100mA at +12V
- Protected against reverse polarity

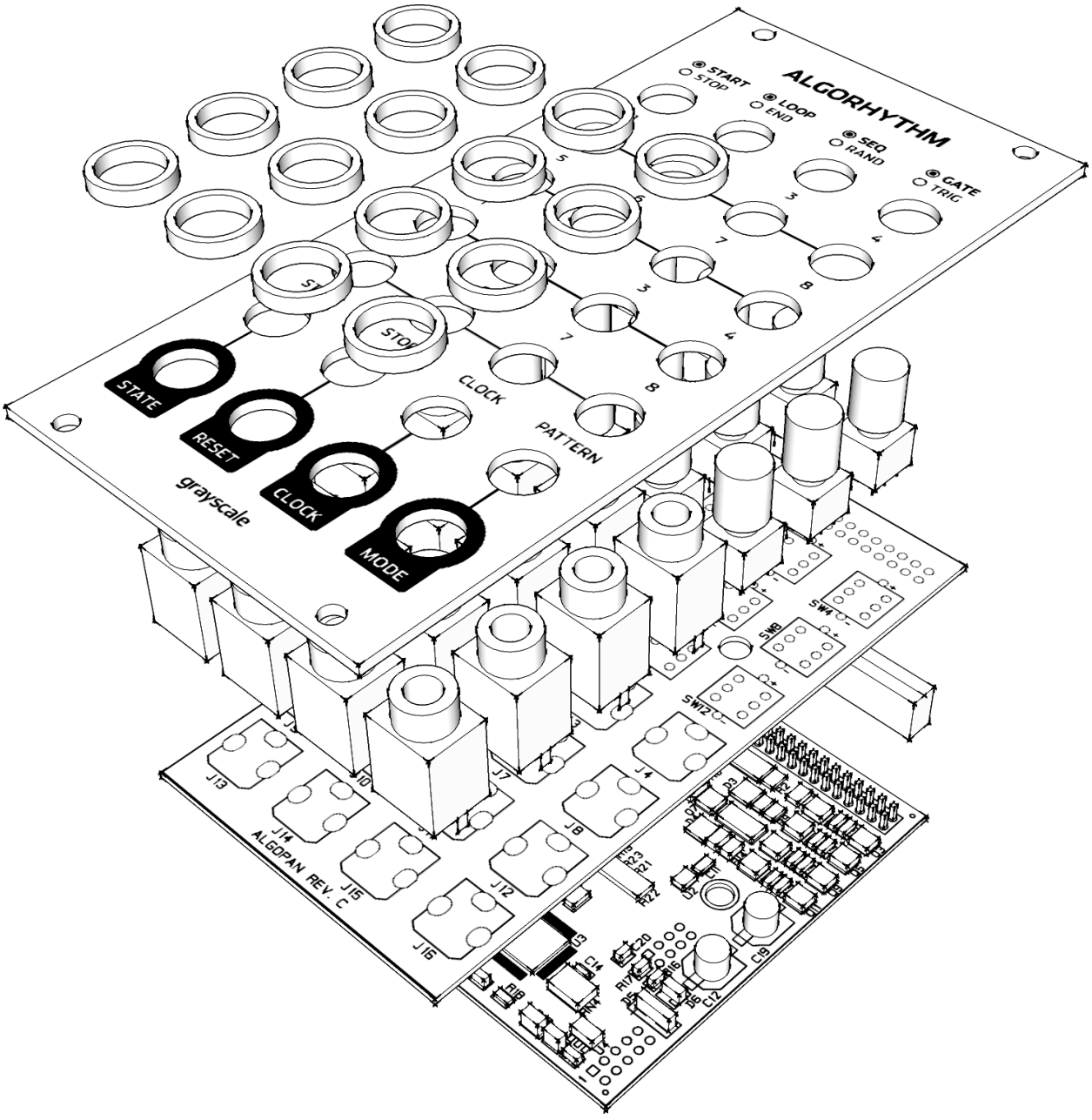
## Check the BOM

Unpack the kit and make sure everything was included. If not, send an email to contact@grayscale.info and we'll mail out any missing parts. Avoid situations that would expose the main PCB to static shocks, as this could damage the microcontroller.

| Item | Notes | Quantity |
|---|---|---|
| Main PCB | Supplied with all SMD components preinstalled | 1 |
| Panel | Aluminum with Metalphoto graphics | 1 |
| Panel PCB | White soldermask, supplied bare | 1 |
| Jacks | WQP-PJ3410 jacks with round nut | 16 |
| LED switch (white) | PB61303-BL5 (momentary) | 4 |
| LED switch (green) | PB61303-BL6 (momentary) | 8 |
| IDC header | 20x4 pin header for connecting two PCBs | 1 |
| Power cable | IDC 5x2 | 1 |
| Link cable | IDC 4x2 | 1 |
| Standoffs | standoffs with #4-40 screws | 2 |

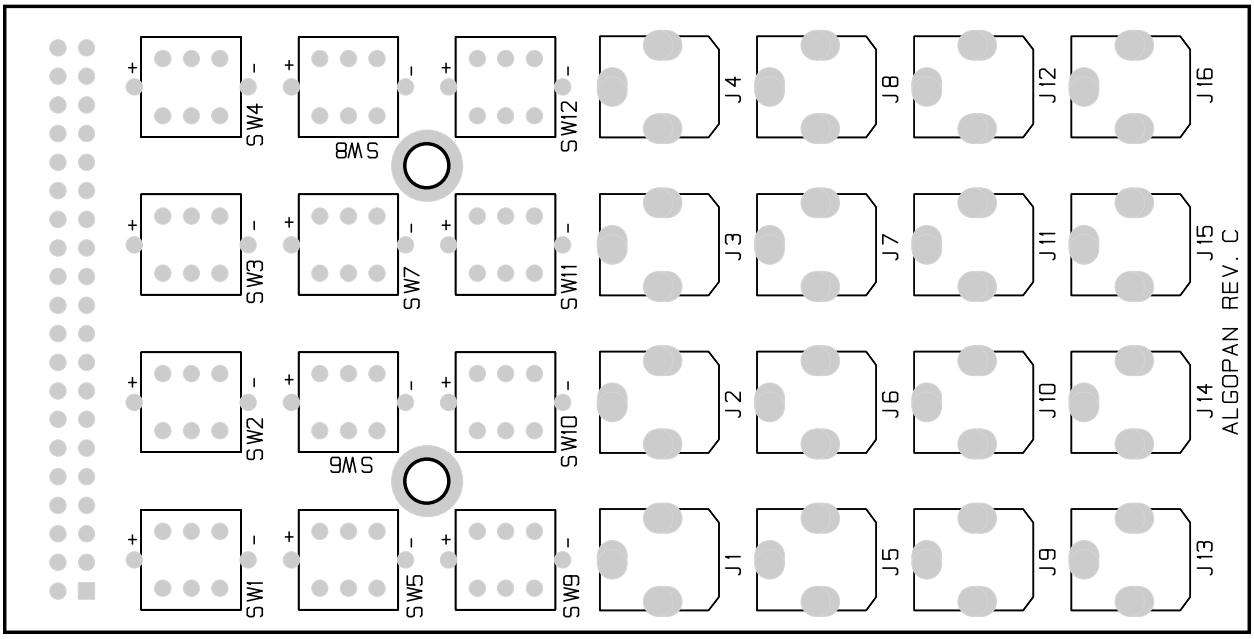
## Axonometric View

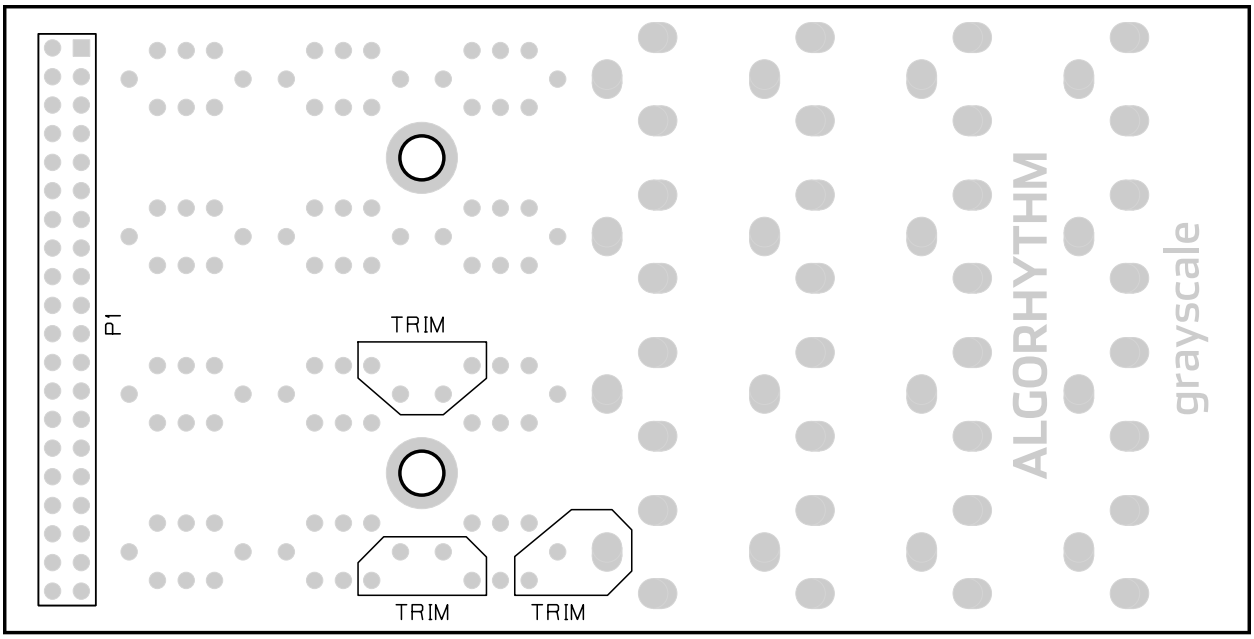
Here's an axonometric drawing to show how everything fits together.



## Warm Up The Iron

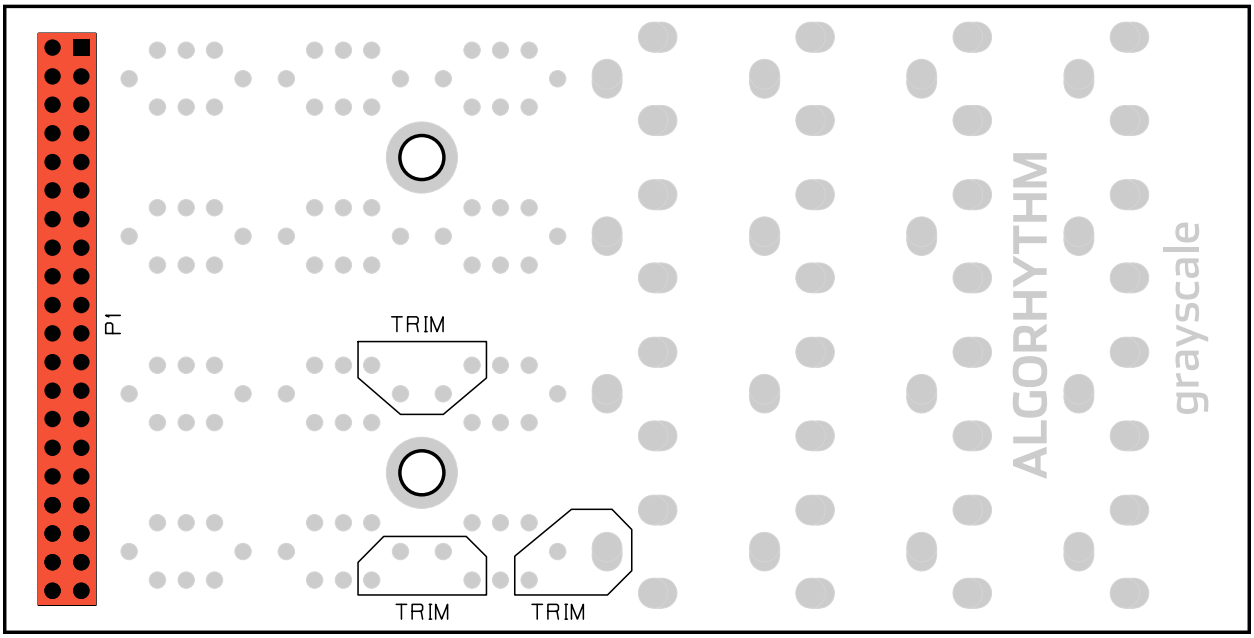
Alright, let's get going. Looking at the panel PCB, the side with the silkscreen for the jack and switch footprints is the **front side** of the PCB. The side with the Algorhythm and Grayscale logos is the **back side** of the PCB.



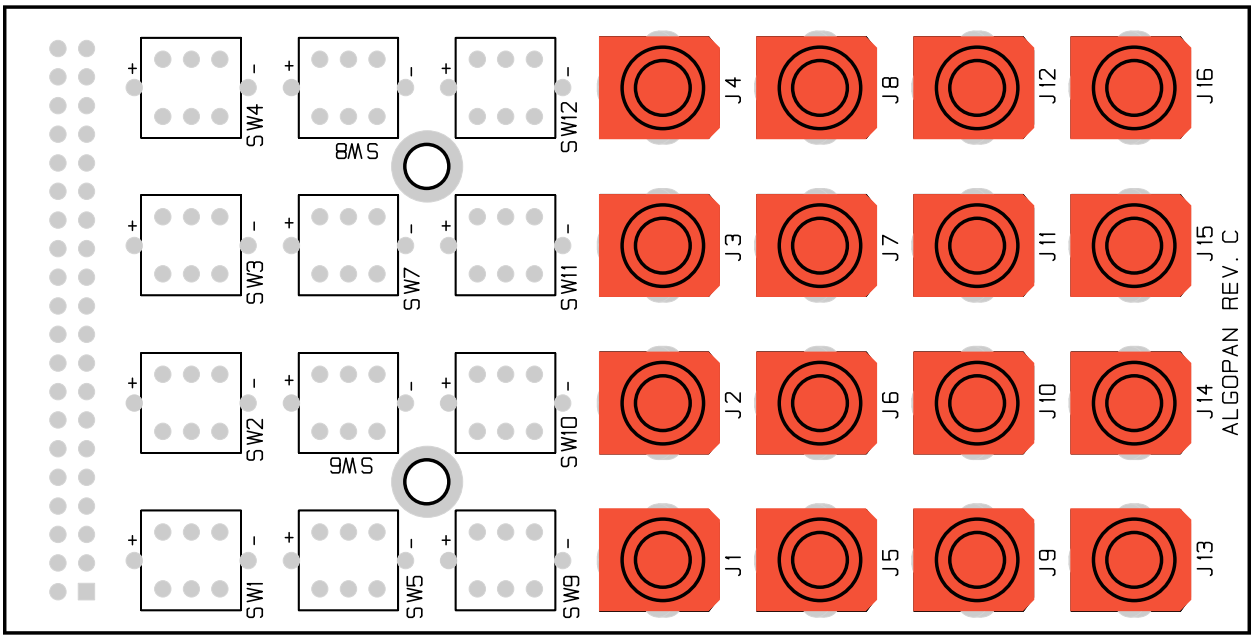
## 40-Pin Header

Start by soldering the 40-pin header onto the **back side** of the PCB. Fit from the back side, solder from the front side. There's no right or wrong orientation. Just make sure the header is on the **back side** of the PCB as shown below.



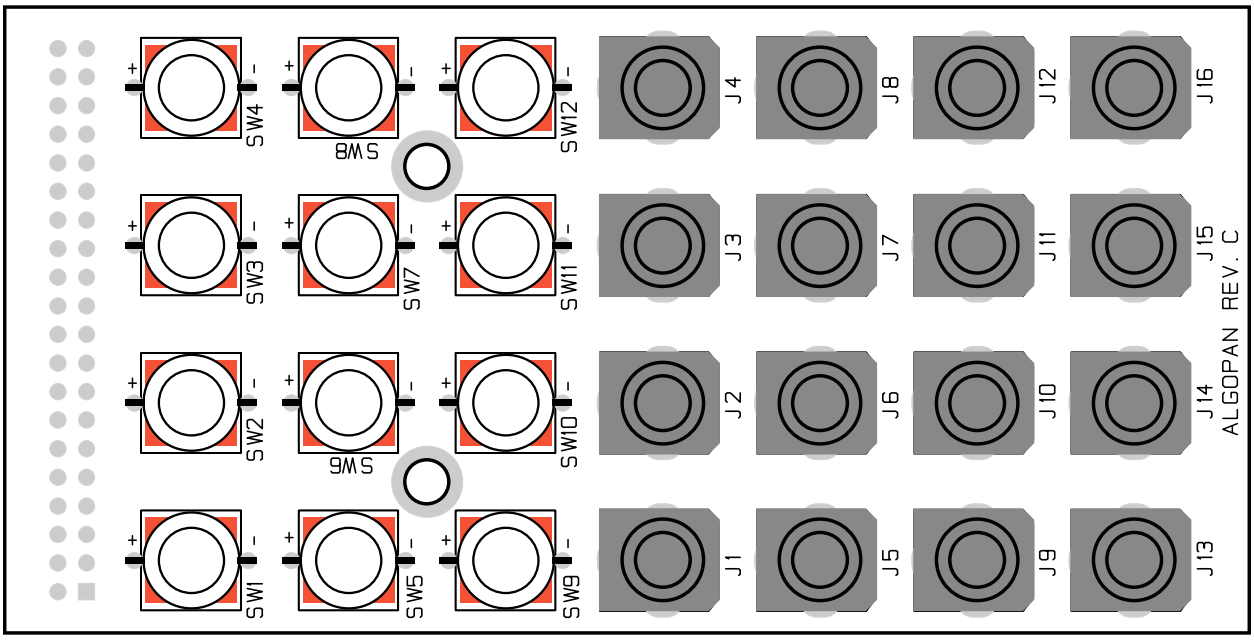
## 3.5mm Jacks

Next up are the jacks. There are sixteen jacks, each with three leads. Fit them to the **front side** on top of the J1-J16 footprints, solder from the **back side**. It's probably a good idea to fit the panel (without the nuts) – this will help keep the jacks in place and will also ensure that everything stays lined up properly as you solder.



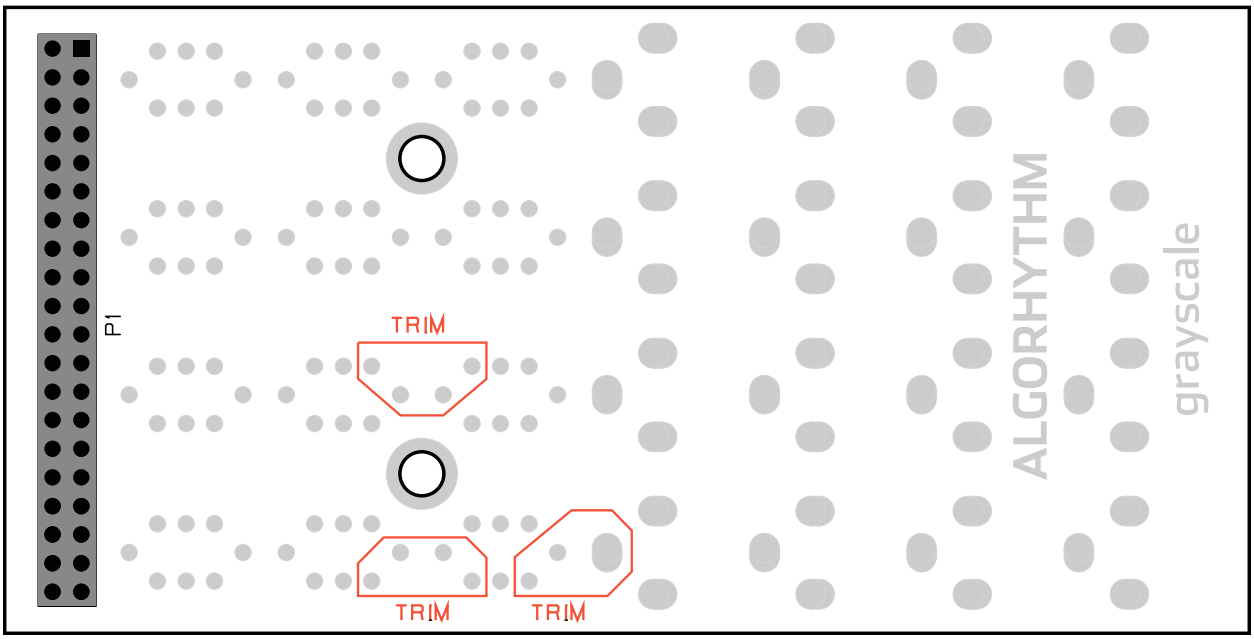

## LED Switches

Solder the LED switches next. You can differentiate the white LED switches from the green ones by looking at the side of the plastic housing for each switch. The white LED switches have a *black* mark on one side, and the green switches have a green mark on one side. This mark represents the cathode (negative side) of the LED. The bottom of each switch also has plus and minus marks to further help with orientation. Align the anode and cathode marks on the switch with the PCB silkscreen graphics and press the switch into place. You should fit the panel once again to ensure that nothing moves during solder. All of the LED switches are installed on the **front side** of the PCB. The white LED switches match up with the **SW1 - SW4** silkscreen labels. Fit to the front, solder from the back. There are 8 leads on each LED switch, solder them all. Once you've installed the four white LED switches, install the eight green ones. These match the **SW5 - SW12** silkscreen labels. Once again, take care to match the anode and cathode of each switch to the PCB silkscreen graphics.




## Trim Marks

Time for a little clean-up work. On the back side of the PCB, there are three areas where you should snip the leads so that they are flush with the PCB surface. This will avoid a potential electrical short between the panel hardware and the main PCB.



## Connect the Two PCBs

Visually inspect the panel PCB, checking for bad solder joints or connections that you might have missed. When you're confident that your work is flawless, fit the main PCB and panel PCB together and install the standoffs. Check the trim points shown above and make sure that the leads won't make contact with the capacitors on the main PCB.

## Panel Installation

The final step is to install the panel. Remove the protective plastic layer first, then fit the panel onto the hardware. Now install the nuts onto the jacks (the slot on the nut faces outwards). For tightening the nuts, we recommend using a small pair of flat-nosed pliers with tape on the ends to avoid scratching the panel.

## Power Up

With the module powered on, check to make sure each of the LED switches illuminates when pressed. All switches are momentary so one press will turn them on, another press will turn them off.

Holding the LOOP/END, SEQ/RAND, or GATE/TRIG switch for 1 second and then releasing it will cause that switch to flash. The 1-8 switches will then be used for changing the module settings. With LOOP/END flashing, the 1-8 switches set the overall sequence length, from a maximum of 8 steps to a maximum of 64 steps. With SEQ/RAND flashing, the individual pattern length can be set, with a range of 1-8 steps. With GATE/TRIG flashing, each of the 1-8 outputs can be programmed to send a gate signal matching the input clock pulse width (LED is on) or a 10ms trigger (LED is off). Press any of the three switches above to exit these custom settings modes.

Now check each of the input and output jacks to make sure that they are sending or receiving logic signals. The inputs are all on the bottom row, with black circles around them. STATE turns playback on or off. RESET restarts the sequence at step 1. CLOCK is the clock input, and MODE toggles between sequential and random playback. The outputs are the 1-8 jacks and the Start, Stop, Clock, and Pattern jacks. Consult the Algorhythm manual for a complete explanation of their functions.

If everything checks out, then congratulations: you just built your own Algorhythm!

On the other hand, if you followed the instructions exactly and triple-checked every detail but the module does not work, send an email to contact@grayscale.info and we'll do our best to help. We also want to hear from you if any parts were missing or defective, or if something about this build guide was unclear.

## Linking Multiple Modules

You can link one or more Algorhythm modules together with the supplied Link cable. There's no limit on the number of modules that can be linked. DIY builds and factory-assembled modules are fully compatible with one another.

## Firmware Hacking

Source files for the Algorhythm firmware are available for those who want to make customizations or completely reprogram the module. Algorhythm uses a Microchip PIC18F66K22 microcontroller, so firmware mods require a compatible programming interface (such as the inexpensive PICkit3). MPLAB, Microchip's IDE for PIC programming, is freely available for Mac OS X, Linux, and Windows.