

Mars Roveriser - by Isn'tses

Explore vast planetary textures through granular sounds via particle crackle generator and fragment synthesis. Mars Roveriser is an experimental granular crackle noise / echo percussion synth inspired by the mars rover robots *Spirit* and *Opportunity*. The sound evokes the dust and chaos of the red planet and the interplanetary transmission of data conjuring resonance through micro textures.

The heart of the synth is an Arduino Nano microcontroller, pre-programmed with custom Isn'tses code which generates PWM audio which is then analog filtered and amplified to line level. The synth is controlled by six knobs, two switches and a pushbutton.

The sound is created from particle generator crackle noise which can be triggered by an internal clock, manually with a pushbutton, and also from external triggers. There are two base noise modes; white noise and a lower-frequency bitcrushed noise. These granular sounds go through a glitchy lo-fi 'reverb' to create a range of metallic pings and strums, didgeridoo sounds and loud overflowing feedback. These controls allow for sonic range including continuous digital echo noise, radio crackle textures, intermittent micro-clicks, rhythmic percussion hits and pulsating drones.

I/O:

There are two output; one audio output to your amp/mixer/recorder/effects, and one for DC trigger pulses so you can trigger or synchronise other synths, sequencers, drum machines, eurorack modules etc.

There is also one trigger input, to sequence the Mars Roveriser's crackles using external gear. This input will accept either a short trigger pulse (e.g. from sequencer, drum machine) or a squarewave/gate signal (e.g. square or pulse wave synths, LFO or gate signals from eurorack). Please note that due to the limitations of the Arduino hardware and the circuit, the trigger input may not track perfectly at extremely high frequencies.

The inputs and outputs are all mono 3.5mm jacks, so it's best to use a mono cable such as a eurorack patch lead. (If you use a stereo aux cable it will work, but audio will only be heard in the left channel).

Controls:

Gain knob: Volume of the crackle particles.

Length knob: Duration of each crackle, from tiny clicks to longer noise bursts.

Speed knob: Internal clock speed, from separate triggers right up into continuous audio frequencies. If turned fully anticlockwise, no sounds will be triggered except by the manual trigger button and/or the trigger input jack.

Space knob: A dry/wet control for the reverb.

Pitch knob: Controls the pitch of the reverb.

Feedback knob: Bipolar control of the reverb feedback amount. Anticlockwise is negative feedback, clockwise is positive feedback. If the knob is centred there's no feedback and if it's at either extreme it goes into full self-oscillation feedback drones/noise. In between you can dial in more conventional metallic reverb or echo sounds.

Chaos/Order switch: Selects between randomised or regular internal trigger clock modes.

Hi Rez/Lo Rez switch: Selects between two different pitch/resolution ranges for the reverb sound.

Pushbutton - trigger or mode-change: Triggers a single crackle texture manually when tapped. If held down for about a second, it toggles the source sound between white noise and a warmer-sounding bitcrushed noise.

Power:

The synth requires a **centre-negative 9v DC** power supply, i.e. standard Boss-style guitar-pedal PSU. Check the voltage and polarity of your power supply is correct to avoid damage. See our blog for links to suitable power units.

You can also power it with a centre-negative 9v battery adaptor for portable use.

Please note that, even though the on-board Arduino has a USB socket, the synth can NOT be powered from USB! If you connect the arduino to USB, the power LED *will* still light up, but the amplifier and filter circuits *will NOT be powered!* So the audio will be very quiet and sound wrong, and you will be very confused.

As this is an open circuitboard synth, handle with care and make sure you don't accidentally short-circuit anything with metal objects. Be careful with loose wires and cables, and don't play it on a bare metal or conductive surface! To keep it protected and stop it sliding about you can put rubber feet on it, make your own plastic or wooden base, or better still buy our laser cut Perspex base kit.

Designed by Tim Drage & Lisa McKendrick, PCB Artwork by Lisa McKendrick

More about the development of the Mars Roveriser on our blog: <https://isntses.weebly.com/blog/>

The Mars Roveriser incorporates Apache 2.0 licenced code by Sean Luke from AE Modular GRAINS.

store: chernobylizer.com - insta: @chernobylizersynth - isntses.com - isntses@gmail.com - [isntses.etsy.com](https://www.etsy.com/shop/isntses)

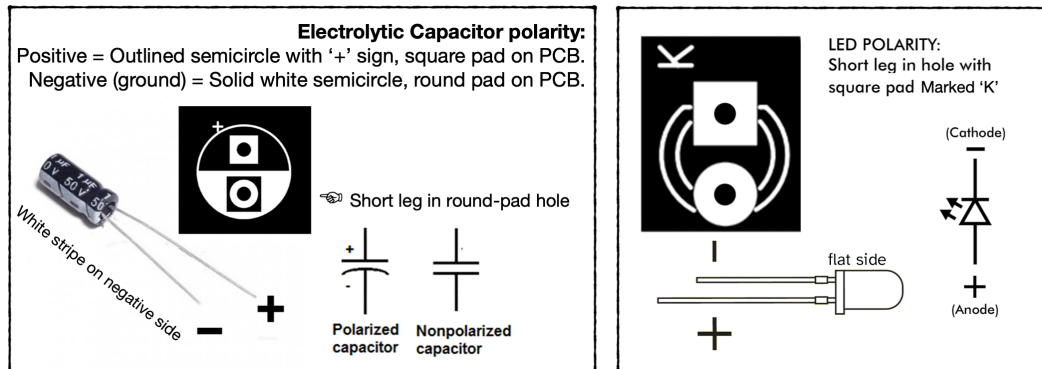
Mars Roveriser - BUILD GUIDE

Populate the components in order of height, as this makes it easier to solder them flat against the board. Put all the resistors in first, solder them, then the other components. It is best to solder in stages rather than populate the whole PCB and try to solder everything at once.

Put all components in the right places, and check the colour codes of resistors. They are written on the BOM and labelled in your kit. **IMPORTANT:** Check the capacitor values or codes which are written on them in tiny numbers, as they can look very similar and there may be mixed varieties (looking different but with the same value) in your kit. Always check all components are in the right place before you solder.

Use electrical tape to temporarily hold components in place for soldering if you need. Once you've put the resistors in you can bend the legs to stop them falling out. Clip the long excess component legs off at the back of the board with side cutters after soldering, but take care not to pull on the component leg in case it damages out the metal pad.

Make sure all polarised components (Diodes, LEDs, electrolytic capacitors) are placed the correct way round:



The power diode has a stripe around it at one end which should match the stripe on the PCB symbol.

Make sure that the half-circle notched ends of ICs and IC sockets match the half-circle notch on the PCB. (Some chips have a circle or dot in one corner instead, depending on the IC brand. Match the end with the dot to the half-circle)

A few components weren't needed and have been omitted. Where they are marked 'NO COMPONENT' in the BOM below, you should just leave those holes empty.

After soldering all components, insert the IC into the chip socket. You may have to carefully straighten the IC legs to fit the sockets, do this by gently pressing the side of them against the table. Make sure that all chip and socket legs go in their correct holes and that none are bent underneath or out to the side

When soldering the socket strips for the Arduino Nano, take care to place them in the correct holes. The PCB has double rows (for testing/modifications) and you must solder the sockets **only in the inner rows**. Connect them to the Arduino Nano pins before soldering to make sure it lines up. Also avoid the four unused mechanical holes at the ends of the pin header rows (the holes without metal solder pads); don't get it offset, nothing goes in these holes! See diagram below.

TESTING:

Once you are sure everything is properly soldered, connect the audio output to your mixer or amplifier, set to a low volume to start with. Plug in the 9v centre-negative DC power.

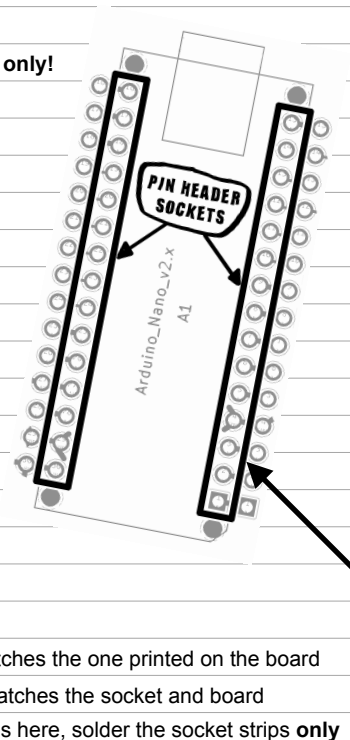
If you don't see the LED light up, or don't hear any sound, unplug the power immediately and check that all components are soldered properly in the right place without dry joints or short circuits, and that you are using the correct PSU.

If it's working you should see the power LED light up. Turn the Gain knob fully clockwise, the Length and Speed knobs about 1/3 clockwise, and the Space knob fully anticlockwise. You should hear short bursts of noise. Turn the Space knob clockwise and hear reverb sounds. Play with all the controls and see what happens.

To read more about the development and background of the Mars Roveriser visit our blog: <https://isntses.weebly.com/blog/>

MARS ROVERISER - Bill of Materials

	Value	Qty	Notes
PCB		1	Mars Roveriser printed circuit board
Resistors			
R12	10R	1	Colour code: Brown, black, black, gold, brown
R1	1k5	1	Colour code: Brown, green, black, brown, brown
R4,R7,R11	1k	3	Colour code: Brown, black, black, brown, brown
R2,R3,R10	10k	3	Colour code: Brown, black, black, red, brown
R5,R8	100k	2	Colour code: Brown, black, black, orange, brown
R9	<i>R9 has been swapped from a resistor to a capacitor, see below!</i>		
R6,R14	NO COMPONENT	X	Leave these empty
Capacitors			
C2,C5,C9	100nF	3	Ceramic or film capacitors, labelled 104 (or u1J63, u1j100 etc, look it up if unsure)
C11	47nF	1	Ceramic or film capacitor, labelled 473
C3,C4	100uF	2	Electrolytic caps. - check polarity, negative stripe to solid half circle on pcb
C6,C8	47uf	2	Electrolytic caps. - check polarity, negative stripe to solid half circle on pcb
R9	1uF - POLARITY: Was originally a resistor so is not marked with a circle. Insert with the positive side (no stripe) facing up towards J4		
C1,C7	NO COMPONENT	X	Leave these empty
Diodes & transistor			POLARITY IS IMPORTANT:
D1	1N5817	1	Match the stripe on the diode to the stripe printed on the PCB
D2	LED	1	Match the short leg and flat side to the square solder pad
Q1	2N3904	1	NPN BJT transistor. Match the orientation of the body to the shape printed on PCB
Jacks			
J2	3.5mm PJ301BM jack	1	Audio output
J4	3.5mm PJ301BM jack	1	Trigger input
J1	3.5mm PJ301BM jack	1	Trigger output
J3	DC barrel jack 2.1mm	1	Power jack - 9v DC Centre-negative power only!
Potentiometers			
RV1	10k crackle length	1	6 x 10k Linear 9mm pots (B103)
RV2	10k crackle gain	1	
RV3	10k crackle rate/frequency	1	
RV4	10k reverb speed/pitch	1	
RV5	10k reverb wet/dry mix	1	
RV6	10k reverb bipolar feedback	1	
Switches			
SW1	Reverb high/low resolution	1	SPDT miniature toggle switch
SW2	Crackles random/ordered	1	SPDT miniature toggle switch
SW3	Manual crackle trigger & mode change	1	Tactile pushbutton switch
Sockets and chips			
U1 socket	IC socket, 8-pin DIP	1	Check the notch at the end of the socket matches the one printed on the board
U1 chip	LM358 dual op-amp, 8-pin DIP	1	Check the notch/dot at the end of the chip matches the socket and board
A1 socket	15 pin socket strip	2	CAREFUL: the PCB has double rows of holes here, solder the socket strips only in the inner rows . Attach the sockets to the Arduino Nano pins before soldering to make sure that it all lines up properly. SEE DIAGRAM ABOVE
A1 Microcontroller	Arduino_Nano_v2.x	1	Arduino microcontroller, provided pre-programmed with Isn'tses noise code.



Mars does not need you

