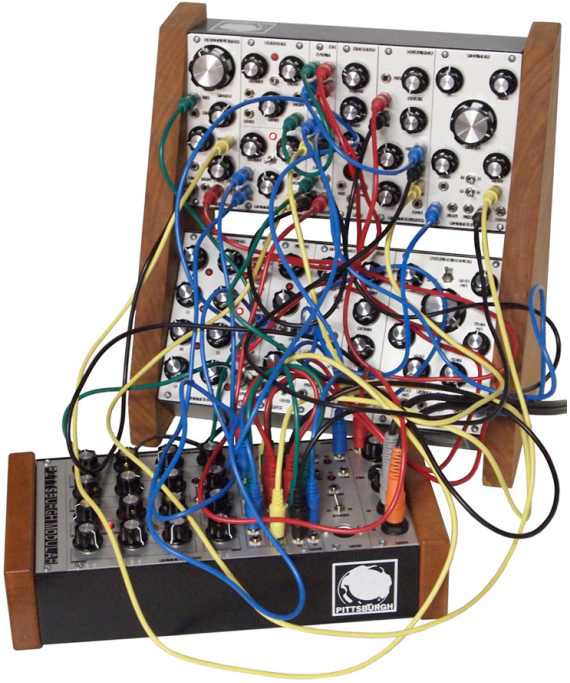

PITTSBURGH MODULAR

Cell[48] Systems Manual & Patch Guide

REV 2

Important Instructions – PLEASE READ

Read Instructions:
Please read the Cell[48] Complete System manual completely before use and retain for future reference.

IMPORTANT Ribbon Cable Power Information:
The Cell[48] Systems Case & Power Supply uses standard 10 and 16 pin Eurorack ribbon power cables to connect modules to the internal bipolar +12v/-12v DC power supply. Please pay very close attention to the orientation of the ribbon cable when adding and removing modules. The stripe on the ribbon cable marks -12v. This stripe needs to line up with the -12v pins on the power supply and the -12v pins on the module. **Failure to match up the pins correctly can result in damage to one or all the modules connected to the power supply.** On the power board, the -12v pins are clearly labeled. On the individual modules, the positive and negative sides of the pin connectors are usually labeled next to the power header on either the top or bottom of the PCB.

Do **NOT** remove individual modules from the case while the power adapter is plugged in.

Do **NOT** unplug ribbon cables from the case or individual modules while the power adapter is plugged in.

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Cell[48] System 1 Package Contents:

1 · Cell[48] System 1 Modular Synthesizer
1 – Pittsburgh Modular Patch Cable 5-Pack
1 – Manual and Patch Guide
1 – External AC Power Adapter

Cell[48] System 2 Package Contents:

1 · Cell[48] System 2 Modular Synthesizer
1 – Pittsburgh Modular Patch Cable 10-Pack
1 – Manual and Patch Guide
1 – External AC Power Adapter

Cell[48] System 3 Package Contents:

1 · Cell[48] System 3 Modular Synthesizer
1 – Pittsburgh Modular Patch Cable 10-Pack
1 – Manual and Patch Guide
1 – External AC Power Adapter

Cell[48] Case and Power Specifications

Cell[48] Case Specifications

Heavy Duty 16 Gauge Steel Frame
Vector Rails Width: 242mm
Sliding Nut Size: #4-40
Panel Screw Size: #4-40

External Case Dimensions: 242mm x 134mm x 57mm
Internal Case Dimensions: 242mm x 130mm x 54.5mm

Space Available for Modules:
Width: 48hp (242mm)
Depth: 53mm
Depth (above power supply): 36mm
Sliding Nuts: 9 (per rail)

Power Supply Specifications

Power Supply Output : +12v 450mA / -12v 450mA

Custom Power Ribbon Cable Includes:
8 - Standard Eurorack 10pin Power Headers
4 - Standard Eurorack 16pin Power Headers

RED STRIPE MARKS NEGATIVE VOLTAGE (-12v)!

Power Switch Installed on Rear of Case
External Power Connection Installed on Rear of Case

External Power Adapter:
Connection: 2.1mm Barrel Type
Output: 12V AC / 1.2A

An Introduction to Modular Synthesis

The Cell[48] Complete System is a powerful, fully modular analog synthesizer, separated into 3 distinct Systems. Used individually or together, the Cell[48] Systems offer an engaging palate for endless sonic experimentation.

A modular synthesizer uses patch cables to route audio and control voltage signals between modules. The Cell[48] Complete System allows the signal flow to be rewired with every patch. Patches can be confined to a single System or Systems can be patched together to create complex synthesizer voices. A finished synthesizer voice can be as simple as listening to the triangle output of an oscillator or as complex as a self running patch using all the modules.

Audio Signal Path and Control Voltage Signal Path

The Cell[48] Complete System signal path is divided into two types of signals. Audio signals and control voltages.

The audio signal is represented by the sound that is produced. The audio signal path starts at a sound source such as an Oscillator, LFO running at audio rate, or the Filter module set to oscillator mode. The audio signal is then patched through other modules used to shape the sound such as mixers, filters, and amplifiers.

Control voltages (CV) are used to manipulate the audio signal in several different ways.

Gates are represented by a high or low control voltage. A gate can be generated using a square or pulse wave from an oscillator or LFO, or by using the GATE output on Midi module. A gate can be shaped using an envelope generator to control the attack, decay, sustain, and release of the gate. The modified gate signal can then be sent to any CV input on the Foundation.

A second use for control voltages is as a modulation source. For example, a control voltage from the CV output of the Midi module patched into the 1V input on the Oscillator controls the frequency of the Oscillator based on the Midi note received. The LFO2 module provides two separate low frequency oscillators that make perfect control voltage modulation sources. Audio signals also make a great control voltage source for Oscillator FM (frequency modulation).

As always, experimentation is essential to getting the most out of a modular synthesizer.

Individual Systems and Modules

The Cell[48] Complete System is a collection of 15 modules separated into 3 individual Systems. The selection of modules in each System was chosen to allow the creation of complex analog sounds. The modular nature of the Cell[48] Complete System allows for deep experimentation and a virtually unlimited sound palate with no hardwired signal path or fixed voice architecture to restrict creativity.

The following pages describe the functionality and controls of the modules within each System.

Cell[48] System 1

The Cell [48] System 1 is a complete single voice, analog synthesizer and a great entry point into modular synthesis. Using the Synthesizer Block module as it's centerpiece, the System 1 contains all of the most important components of a modular synthesizer. Connected internally, the Cell[48] System 1 is hardwired to create a complete monophonic synthesizer without needing to add patch cables. However, each major component within the System 1 is fully patchable and can function independent to the rest of the system by using the available patch points and included patch cables.

An unpatched Cell[48] System 1 offers direct access to a wide array of classic analog monosynth sounds. Without a single patch cable, deep bass and warm sweeping leads are just a few knob tweaks away.

Plugging in a few patch cables opens the Cell[48] System 1 to experimentation by offering unlimited control over both the modulation and audio signal paths. The full functionality of the Oscillator, Filter, LFO, Envelope Generator, VCA, Midi, and Outputs can be broken apart and used like standalone synthesizer modules. All of the elements of a classic voltage controlled, modular synthesizer are available as an open, patchable, modern synth.

Cell[48] System 1 - Synthesizer Block

Synthesizer Block Description:
Wired for instant access to classic tones without needing a single patch cable, the Synthesizer Block is a complete semi-modular, monophonic synthesizer. The Synthesizer Block is 100% analog with a complete set of patch points able to override the internal audio and CV signal path.
The Synthesizer Block was designed to be the core of the Cell[48] Complete System. Each major component within the Synthesizer Block is fully patchable and can function independent to the rest of the module. This allows the functionality of the Oscillator, Filter, LFO, Envelope Generator, and VCA to be broken apart and used like standalone modules.

Module Components:
Full Range Sawtooth Core Oscillator
Oscillator Waveform Mixer
Voltage Controlled Low Pass Filter
Wide Range Low Frequency Oscillator
Glide Control for Portamento Effects
ADSR Envelope Generator
High Quality, Linear Response, Voltage Controlled Amplifier

Cell[48] System 1 - Synthesizer Block (continued)

Oscillator Section:
Frequency Knob - Coarse frequency setting.
Fine Tune Knob - Fine tune frequency setting.
FM CV In Knob - Frequency modulation CV input attenuator.
Internally patched to LFO triangle wave.
PWM CV In Knob - Pulse width modulation CV input attenuator.
Internally patched to LFO triangle wave.
1V/O In - CV input used to track the Oscillator at 1 volt per octave.
Reset In - CV Input used to hard reset the Oscillator.
FM CV In - CV input controls the linear frequency modulation.
PWM CV In - CV input controls the pulse width of the square wave.
TRI OUT - Triangle wave output
SAW Out - Saw wave output
SQR Out - Square wave output
MIX Out - Mixer section output. Internally routed to Filter input.

LFO Section:
Rate Knob - Coarse Frequency setting.
Range Switch - Switches the frequency range.

Filter Section:
Cutoff CV IN Knob - Cutoff CV input attenuator.
Cutoff Knob - Cutoff frequency setting.
Resonance Knob - Resonance (Q) setting.
Cut CV IN - Cutoff CV input.
Filter In - Filter section input.
Filter Out - Filter section output. Internally routed to VCA input.

Envelope Generator Section:
Attack Knob - Attack setting.
Decay Knob - Decay setting.
Sustain Switch - On/Off sustain setting.
Release Knob - Release setting.
EG In - Envelope Generator input.
EG Out - Envelope Generator output. Internally routed to VCA input.

Glide Section:
Time Knob - Portamento amount. Internally routed to 1V/O In.

Mixer Section:
Triangle Wave Knob - Triangle wave level control.
Saw Wave Knob - Saw wave level control.
Square Wave Knob - Square wave level control.

VCA Section:
Output Level Knob - Output level control.
VCA CV In - CV input used to control the output level.
VCA In - VCA section input.
VCA Out - VCA section output. Internally routed to Outs Left Input.

M3 Description:
The M3 is a unique signal routing module with 3 distinct sections able to perform several different functions at once. Signal splitting, mixing, and buffering are combined to create a module that is both compact and incredibly useful.

The top section labeled MULT, is a standard 4 jack passive multiple used to create 3 copies of the original signal. One input becomes up to 3 identical outputs.

The bottom 2 sections, MIX1 and MIX2, both function the same way. Two input and 2 outputs allow each section to be used as a 2 channel unity gain mixer, signal buffer, and buffered multiple.

M3 Controls:
Section 1 (MULT)
All 4 jacks function the same. Although the jacks are labeled I, O, O, O, any jack can be used as the input allowing the remaining 3 jacks to be used as outputs.

Section 2 and 3 (MIX1 and MIX2)
There are two types of jacks in the Mix sections, inputs (I) and outputs (O). Each Input functions identically and each output functions identically. The two inputs can be used together to create a 2 channel unity gain mixer and the two outputs can be used as a buffered multiple. Combining both features together allows the M3 to perform a wide range of functions at once.

Cell[48] System 1 - Midi2

Midi2 Description:
The Midi2 converts standard midi note messages into the analog control voltages used by modular synthesizers. This allows a modular synthesizer to be controlled by a midi keyboard, sequencer, or DAW. The Midi2 module has 3 distinct modes of operation.

1. Monophonic - (M) Gate2 and CV2 outputs mirror the outputs of Gate1 and CV1. Monophonic mode works great when using a modular as a single voice synthesizer.
2. Duophonic - (P) The Midi2 module uses the two sets of Gate and CV outputs to allow two notes to be played simultaneously. The first midi note is sent to the Gate1 and CV1 outputs and the second is sent to the Gate2 and CV2 outputs. Duophonic mode is perfect when working with a two voice modular synthesizer.
3. Dual Monophonic - (D) Gate 2 and CV2 outputs are controlled by a different midi channel than the Gate 1 and CV 1 Outputs. Dual Monophonc mode allows a modular to be controlled by two separate sets of midi data. This mode works well when using a modular as two single voice synthesizers

Assigning Midi Channel and Controls:
Midi Channel is assigned based on the first midi note on message received.
GT1 Output – Note on = Gate high (+5v), Note off = gate low (0v)
CV1 Output – 1 volt per octave voltage derived from note played on keyboard.
GT2 Output – Note on = Gate high (+5v), Note off = gate low (0v)
CV2 Output – 1 volt per octave voltage derived from note played on keyboard.
Sync Output – Outputs gate based on beat 1 of the incoming midi clock.
Midi Input – Input jack for a standard 5-pin midi cable.

Cell[48] System 1 - Outs

Outs Description:
A simple way to get sound out of the Cell[48] Complete System. Outs is a dual independent output module featuring a stereo 1/4" headphone amplifier output and dual mono 1/4" line level outputs.

Outs Controls:
Left Input - Left Channel Modular Signal Input
Right Input - Right channel modular signal input. If not used, the left input signal is sent to both left and right outputs.
Stereo Knob - Volume control for stereo headphone output.
Stereo Output - 1/4” headphone output.
Line Level Knob -Volume control for left and right line level output.
Left Line Output - 1/4” line level output.
Right Line Output - 1/4” line level output.

Cell[48] System 2

The Cell [48] System 2 is a signal manipulation powerhouse. A modular multi-effects processor packed with all the tools needed to sculpt audio and twist control voltage signals. This system is packed with features. An 8 step sequencer pairs with the dual LFO to create complex control voltage patterns or clock the Sequencer with an external Oscillator to create a crushing sub-octave generator. At only 6hp in width, the Toolbox module is overstuffed with circuitry. Slew, sample & hold, noise, and a voltage inverter. Audio signals are covered with a triple mode ring modulator that can be used for everything from classic bell tones to bruising distortion and a full second of classic, voltage controllable analog delay. Free from the constraints of hardwired signal paths and limited routing options, the Cell[48] System 2 Modular Signal Processing Unit takes control to a new level.

Cell[48] System 2 - Sequencer

Sequencer Description:
An 8 step analog sequencer. It uses an external clock to cycle through 4, 6, or 8 steps. The output of the sequencer can be used control the pitch of an oscillator, modulate a filter, or manipulate any module with a CV input.

Complex sequences can be created using a combination of the Reset, Hold, and Add inputs. The Reset input can be used to create odd or variable length loops while Hold pauses the movement of the sequencer. Voltage from the Add input is summed with the voltage created by the Sequencer transcribing the output.

The Sequencer module also makes a great sub-octave generator. Clocking the Sequencer at audio rates using the square wave of an Oscillator turns the Sequencer into a sub-octave waveform generator able to produce 1, 2, or 3 octaves below the frequency of the clock.

Sequencer Controls:
Voltage Knobs - Sets the output voltage from 0-10v for each of the 8 sequencer stages.
Variable Step Count Switch - Sets the number of steps the Sequencer module cycles through.
Clock Input - Clock source can be a square wave, gate or trigger signal.
Reset Input - Positive voltage resets the Sequencer to the first step.
Hold Input - Positive voltage pauses the Sequencer.
Add Input - Control Voltage Adder. Adds voltage of incoming signal to the output of the Sequencer.
Outputs - Dual buffered sequencer outputs.

Cell[48] System 2 - LFO2

LFO2 Description:
A dual low frequency oscillator module. It uses two different types of low frequency oscillator circuits to provide a variety of CV and audio rate modulation options. The top LFO utilizes rate and symmetry controls to generate shifting waveforms. Adjusting the symmetry control varies the shape of the TRI output waveform from a saw tooth to triangle to ramp wave. The symmetry control also adjusts the pulse width of the SQR wave output. The bottom LFO is a simple triangle based low frequency oscillator with rate control over the triangle and square outputs.

LFO 1 Controls (top)
Rate Knob - Coarse frequency setting.
Symmetry Knob - Modify the shape of the waveforms.
TRI Output - Saw / Triangle / Ramp wave output.
Range Switch - Switches the frequency range.
SQR Output - Square / Pulse wave Output.

LFO 2 Controls (bottom)
Rate Knob - Coarse frequency setting.
TRI Output - Triangle wave output.
Range Switch - Switches the frequency range of LFO 2.
SQR Output - Square wave output.

Cell[48] System 2 - Toolbox

Toolbox Description:
A multi-purpose Slew, Noise, Sample & Hold, and Inverter Module. A versatile module capable of performing 4 distinct jobs at once.

Toolbox Slew Section Controls:
Slew Amount Knob - Controls the amount of glide.
Slew Input - Slew input jack.
Slew Output - Slew output jack.

N-SH (Noise / Sample & Hold) Section Controls:
N– Noise Output
I - Sample & Hold Voltage Input (Internally patched to Noise Output).
H - Sample & Hold Hold clock input.
O - Sample & Hold voltage output.

Invert Section Controls:
I - Voltage input jack.
O - Voltage output jack.

Cell[48] System 2 - Modulator

Modulator Description:
The Modulator offers 3 types of effects based on the standard Ring Modulator circuit. Typical uses can create bell-like or metallic sounds.

Type 1: Ring Modulator - Outputs the sum and difference of the X and Y inputs. Switch set to the left.
Type 2: Floating Z Modulator - Outputs the sum and difference of the X and Y inputs summed with the ambient voltage within the circuit. Switch in the center.
Type 3: Linear Amplitude Modulator - Outputs the sum and difference of the X and Y inputs summed with the carrier (Y) signal. Switch set to the right.

Modulator Controls:
X Signal Knob - Input 1 attenuator.
Y Signal Knob -Input 2 attenuator.
X Mix Output Knob - Mix of the X input with the output of the modulation circuit.
X Signal Input - Input 1 jack.
Y Signal Input - Input 2 jack.
Ring Modulator Type Switch - Selects the ring modulator circuit.
OUT - Ring modulator output.

Cell[48] System 2 - Analog Delay

Analog Delay Description:
An analog delay module designed around a pair of 4096 Bucket Brigade Delay Line (BBD) chips to produce a distinct analog delay effect with a maximum delay time of one second. The Analog Delay offers voltage control of the delay time, feedback, and wet signal. A true bypass switch allows the delay to be enabled and disabled quickly.

Analog Delay Controls:
Feedback Knob - Controls the level of feedback.
Bypass Switch - Bypass switch for the analog delay effect.
Feedback CV Attenuator Knob - Feedback CV input attenuator.
Rate Knob - Controls the delay time of the analog delay effect.
Rate CV Attenuator Knob - Rate CV input attenuator.
Wet CV Attenuator Knob - Wet CV input attenuator.
Dry Output Attenuator Knob - Dry output level control
Wet Output Attenuator Knob - Wet output level control
Audio Input - Analog delay input.
Feedback CV Input - Feedback CV input jack.
Rate CV Input - Rate CV input jack.
Wet CV Input - Wet CV input jack.
Feedback Output - Wet signal only output jack.
Mix Output - Wet and dry signal output jack.

Cell[48] System 3

The Cell [48] System 3 is an experimental analog modular synthesizer perfect for generating evolving textures and complex soundscapes. An eclectic selection of modules and extremely complex modulation options allow for unlimited musical creativity with a very small footprint. Not confined to the limitations of standard synthesizer routing conventions, the Cell [48] System 3 is a unique sonic laboratory.

Cell[48] System 3 · Oscillator

Oscillator Description:
A wide range, multiple waveform generator. The Oscillator has a frequency range starting as low as 7 seconds per cycle, allowing it to double as a voltage controlled LFO.

Oscillator Controls:
Big Knob – Course frequency setting.
Fine Knob · Fine tune frequency setting. This control is calibrated to a range of 1 octave.
1V Input · CV input used to track the Oscillator at 1 volt per octave.
RT · CV Input used to hard reset the Oscillator on the falling edge of the incoming waveform.
FM Knob and Input · Linear frequency modulation CV input attenuator and input.
PW Input · Pulse width modulation CV input. Affects the pulse width of the square wave.
PW Knob · Manually controls the pulse width of the square wave.
SIN Output – Sine wave output.
TRI Output – Triangle wave output.
SAW Output – Saw wave output.
SQR Output – Square wave output.

Cell[48] System 3 - Bender

Bender Description:
A dual voltage controlled low frequency oscillator built around two triangle core, wide range, low frequency waveform generators. A low frequency cousin to the Generator, this multipurpose signal generator can provide the basis of a wide range of complex modulations ideal for amplitude, frequency and timbral modulation.

The Bender module is split into two separate voltage controlled LFOs. Each LFO is controlled by a separate rate knob, range switch, control voltage input attenuator, and variable wave shape knob.

The two LFOs of the Bender module are wired together internally for frequency cross modulation. The Variable Waveform output of each LFO is wired to the Rate CV input of the other. This controlled feedback loop creates everything from rhythmic patterns to wild, chaotic modulations. The internal connections can be broken by inserting a patch cable in the Rate CV Input jack.

Bender Controls:
Rate Knob - Controls the frequency of the oscillator.
Variable Waveform Knob - Controls the waveshape of the variable output. Acts as an attenuator for VCV input.
Rate CV Attenuator Knob - Controls the amount of CV used to control the rate of the oscillator.
Rate Range Switch - 3 range settings, low (LFO range), high, medium.
VCV Input - Variable waveform control CV input.
RCV Input - Rate control CV input.
TRI Output - Triangle wave output.
VAR Output - Variable wave output.

M3 Description:
The M3 is a unique signal routing module with 3 distinct sections able to perform several different functions at once. Signal splitting, mixing, and buffering are combined to create a module that is both compact and incredibly useful.

The top section labeled MULT, is a standard 4 jack passive multiple used to create 3 copies of the original signal. One input becomes up to 3 identical outputs.

The bottom 2 sections, MIX1 and MIX2, both function the same way. Two input and 2 outputs allow each section to be used as a 2 channel unity gain mixer, signal buffer, and buffered multiple.

M3 Controls:
Section 1 (MULT)
All 4 jacks function the same. Although the jacks are labeled I, O, O, O, any jack can be used as the input allowing the remaining 3 jacks to be used as outputs.

Section 2 and 3 (MIX1 and MIX2)
There are two types of jacks in the Mix sections, inputs (I) and outputs (O). Each Input functions identically and each output functions identically. The two inputs can be used together to create a 2 channel unity gain mixer and the two outputs can be used as a buffered multiple. Combining both features together allows the M3 to perform a wide range of functions at once.

Cell[48] System 3 - VC Bend

VC Bend Description:
The VC Bend is designed as a way to create less than certain variations from pre-determined control voltages, like transposing / inverting a bass line into a melody or creating a 3rd envelope from 2 sources. Used at audio rate, it acts like a voltage controlled full wave rectifier. The VC Bend favors 'esoteric' applications over precision. More often than not the output voltage will not resemble the input. Functionally, the VC Bend sits somewhere between a sample and hold and a quantizer module. However, the type of modulation produced is completely unique to the VC Bend.

The VC Bend takes a bipolar (positive or negative) control voltage input and modulates it by the amount of the CV Input in relation to the Internal Voltage Reference. The output is a voltage which is always above 0V, the direction (moving with or away from the input) of which can be altered with an external voltage.

VC Bend Controls:
MAIN Knob - Attenuverted Gain Knob for the IN input. Knob zeros out at 12 o'clock.
MOD Knob - Attenuverted Gain Knob for the CV input. Knob zeros out at 12 o'clock.
INT Knob - Internal Voltage Reference Knob (0v - 10v).
IN - Input for the signal to be modulated. Input can be positive or negative CV or audio rate signal.
CV - Modulation source input. Input can be positive or negative CV or audio rate signal.
OUT - Modulated signal output. Output can be positive CV or audio rate signal.

Cell[48] System 3 - Filter

Filter Description:
The Filter is a voltage controlled, analog, state variable filter. The state variable topology was chosen because it allowed us to produce a very smooth and natural sounding filter, in addition to offering several other modes of operation, each with a unique sound and energy all their own.

The Filter defines the sound of Pittsburgh Modular. It offers a warm, organic sweep through the full frequency range. The lowpass filter is gummy and relaxed while the highpass is clean and defined. The goal was to produce a filter that did not have a sweet spot; where the every turn of the frequency knob produced something interesting.

Modes of Sound:
Multiple filter responses are available simultaneously including lowpass, highpass, and bandpass. The fourth filter response is a variable response that shifts between lowpass, notch, and highpass.

Switch It Up:
Two switches, Gain and Mode, further expand the capabilities of the Filter. The Gain switch modifies the functionality of the Q while the Mode switch toggles between filter and oscillator modes. Setting the Gain switch to "1" converts the Q setting into a VCA circuit for the audio input. Switching the Gain switch to "Q" returns the standard filter Q response.

Cell[48] System 3 - Filter (continued)

Mode switches between Filter and Oscillator modes. Set to "Filter", the Pittsburgh Modular Filter will not self oscillate. Set to "Oscillator" the Filter produces a high quality voltage controlled sine wave. Adjusting the Q while in Oscillator mode modifies the shape of the waveform. At more extreme settings the Q adds anything from warm fuzz to heavy distortion the incoming audio.

Filter Controls:
Q Pot: Adjusts the resonance (Q) of the filter.
FREQ Pot - Adjusts the Frequency of the filter.
L-H Pot - Sweeps between lowpass, notch, and highpass filters.
QCV Pot and Jack - Resonance (Q) control voltage input and attenuverter.
FCV Pot and Jack - Frequency control voltage input and attenuverter.

1-Q Switch - Switch between Gain to 1 (VCA Mode) and Gain of Q (Standard Mode)
F-O Switch - Switch between Filter and Oscillator Modes

LOW Jack - Lowpass Output
L-H Jack - Output based off of the L-H Pot
HI Jack - Highpass Output
BND Jack – Bandpass Output

Cell[48] System 3 - Dual VCA

Dual VCA Description:
The Dual Index is a dual linear voltage controlled amplifier (VCA) and a two channel voltage controlled mixer. It has two standalone VCAs and a fully buffered mix output. Each channel offers offset gain and CV attenuation. The CV and IN of channel 2 are normaled to channel 1. If left un-patched, channel 2 will operate using the channel 1 CV and IN signals.

Dual VCA Controls:
Index 1 (VCA 1):
CV - CV Input used to control the VCA.
CV Knob - CV input attenuator.
In - Signal Input
Out - Signal Output

Index 2 (VCA 2):
CV - CV Input used to control the VCA.
CV Knob - CV input attenuator.
In - Signal Input
Out - Signal Output

Mix - Fully Buffered mix of the VCA 1 and VCA 2 outputs.

Patching a Modular Synthesizer

The following pages contain many examples of how to patch the Cell[48] Systems. The examples have been chosen to showcase the flexibility of the Systems and to highlight as many features from each module as possible. Use the patches provided as a teaching tool. Once you have setup a patch, adjust knobs and remove cables from the Systems while referencing the module description pages within the manual. This will help develop an understanding of what function each part of the patch is performing.

The patch guide provides test patches and examples using the modules within the Cell[48] Systems. These patches are designed to showcase the core functionality as well as additional features of the highlighted module. In general, the test patches will provide a way to focus attention on the capabilities of a single module and may not provide results that would be considered musical.

Working with individual modules can be fun but the true power of any modular synthesizer comes when different modules start to interact. Patching the output of one module to the input of another is a fundamental part of modular synthesis. Even though the Cell[48] Systems are designed to be a tabletop modular, the patches can become complex quickly. Any output can be patched to any input. Understanding the capabilities and functionality available from each module will allow even the most complex patches to be understood easily.

If you come up with a good patch, we want to try it! Send all your interesting patches to info@pittsburghmodular.com.

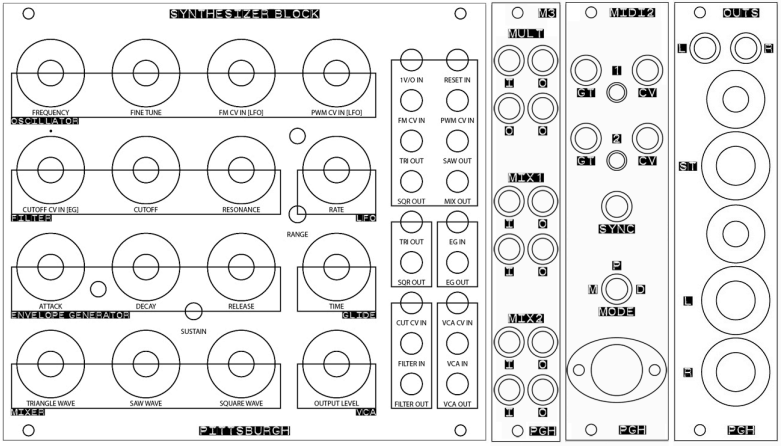
Cell[48] System 1 Patch Examples

Patch examples using the Cell[48] System 1.

The System 1 has a few internal patches that allow for faster setup and simpler use.

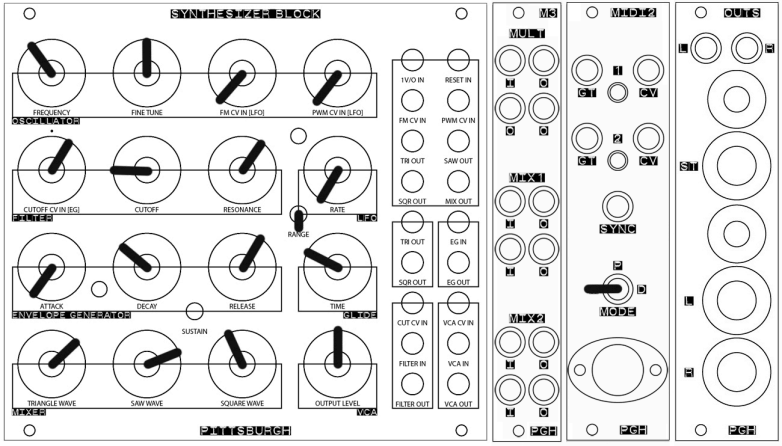
The VCA Output of the Synthesizer Block module is internally patched to the Left and Right inputs of the Outs module. The internal patching can be disrupted by plugging a patch cable into the Left input of the Outs module.

The Midi2 module Gate1 is internally patched to the 1V/O input of the Synthesizer Block module. The internal patching can be disrupted by plugging a patch cable into the 1V/O input of the Synthesizer Block module.



The CV1 Output is internally patched to the EG input of the Synthesizer Block module. The internal patching can be disrupted by plugging a patch cable into the EG input of the Synthesizer Block module.

Cell[48] System 1 - Basic Patch



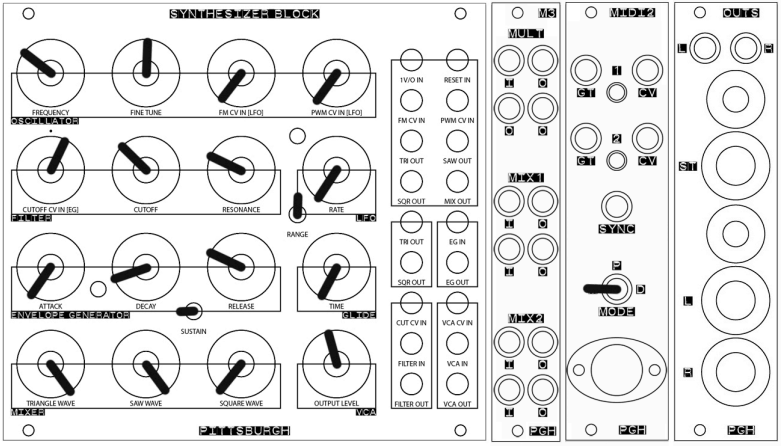
Basic monophonic synthesizer patch.

Adjust the Cutoff, Resonance, and Cutoff CV In along with the Glide and Envelope Generator controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block. No patch cables are needed to use this patch.

Plug in a pair of headphones and/or use the 1/4" output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

Cell[48] System 1 · Soft Bottom Bass



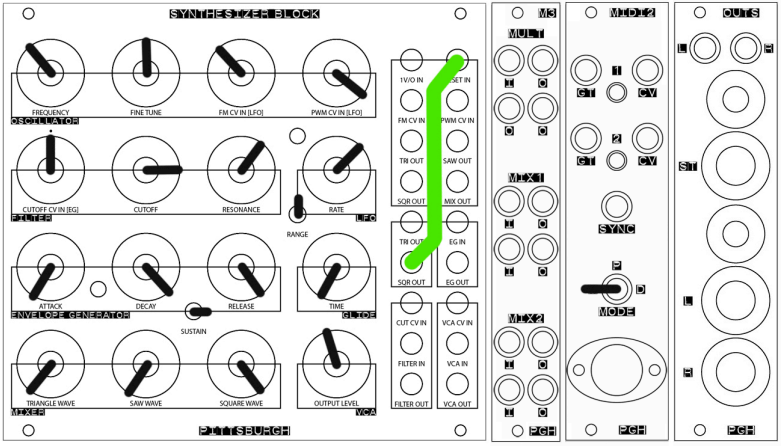
Simple monophonic bass synthesizer patch.

Adjust the Cutoff, Resonance, and Cutoff CV In along with the Glide and Envelope Generator controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block. No patch cables are needed to use this patch.

Plug in a pair of headphones and/or use the 1/4" output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

Cell[48] System 1 - Square Controlling Square



Resetting the Oscillator using the Square wave output of the LFO.

Adjust the Cutoff, Resonance, and Cutoff CV In along with the FM CV In and PWM CV In controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block.

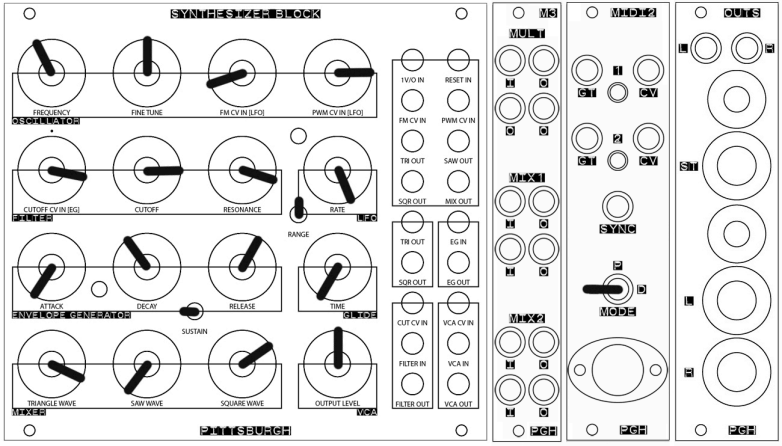
Plug in a pair of headphones and/or use the 1/4" output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

Cell[48] System 1 - 8-Bit Arcade

The 8-Bit arcade patch uses the internal routing of the LFO triangle wave running at audio rates to modulate the FM CV Input and PWM CV Input.

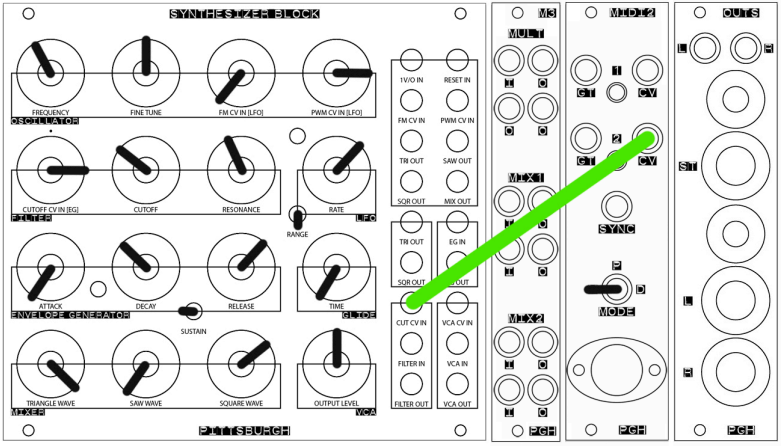
Adjust the Cutoff, Resonance, and Cutoff CV In along with the LFO Rate, FM CV In and PWM CV In controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block. No patch cables are needed to use this patch.



Plug in a pair of headphones and/or use the 1/4” output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

Cell[48] System 1 - Warm Bottom / Crisp Top



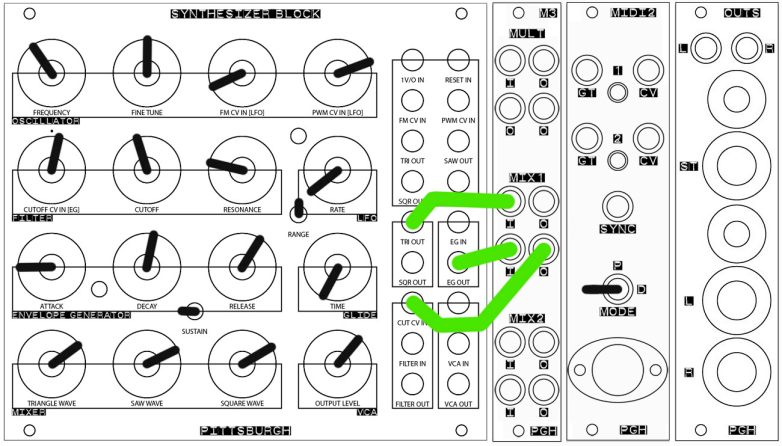
The Filter cutoff in this patch is changed based on the note played. The higher the note the more the cutoff is opened. This creates warm low notes and crisp high notes.

Adjust the Cutoff, Resonance, and Cutoff CV In to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block.

Plug in a pair of headphones and/or use the 1/4" output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

Cell[48] System 1 · Cosmos



Cosmos uses the triangle wave of the LFO mixed with the output of the Envelope Generator to control the cutoff frequency of the Filter.

Adjust the Cutoff, Resonance, and Cutoff CV In along with the LFO Rate, FM CV In and PWM CV In and Envelope Generator controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block.

Plug in a pair of headphones and/or use the 1/4” output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

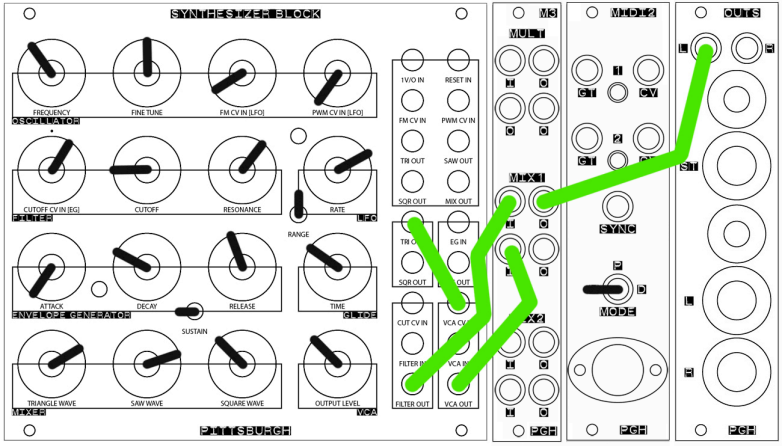
Cell[48] System 1 - Electro-Kitten Hand Drum

This patch uses the Triangle wave of the LFO to trigger the VCA. The output of the VCA is mixed with the output of the Filter to create an interesting tone.

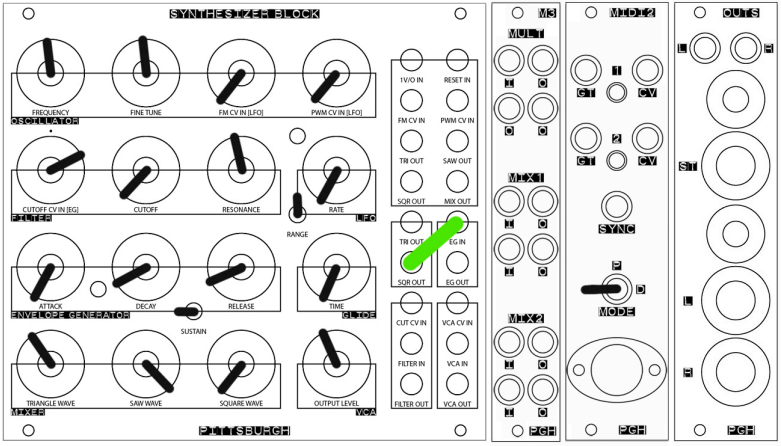
Adjust the Cutoff, Resonance, and Cutoff CV In along with the LFO Rate, FM CV In and PWM CV In controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block.

Plug in a pair of headphones and/or use the 1/4" output jacks into the Outs module to listen to the patch.



Cell[48] System 1 · Picking Metronome



The Picking Metronome patch uses the Square wave from the LFO to trigger the Envelope Generator creating a metronome effect.

Adjust the Cutoff, Resonance, and Cutoff CV In along with the LFO Rate, FM CV In and PWM CV In controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch. This patch takes advantage of the internal routing between the CV1 outputs of the Midi2 module with the 1V/O Input of the Synthesizer Block.

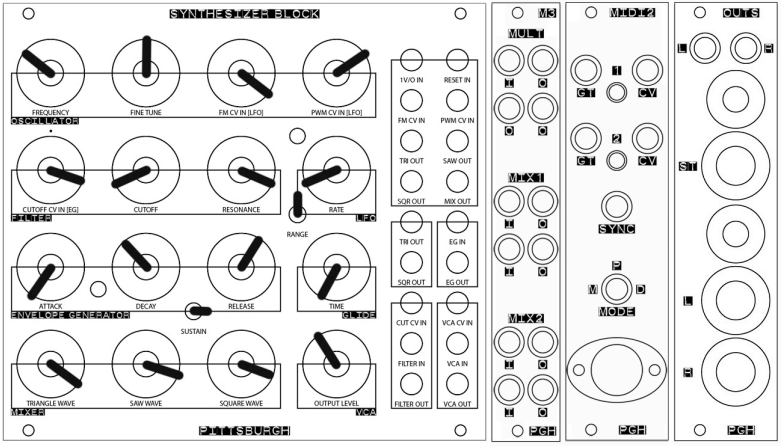
Plug in a pair of headphones and/or use the 1/4" output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

Cell[48] System 1 - Sonic Disturbance

Sonic Disturbance uses the internal routing of the LFO triangle wave to modulate the FM CV Input and PWM CV Input.

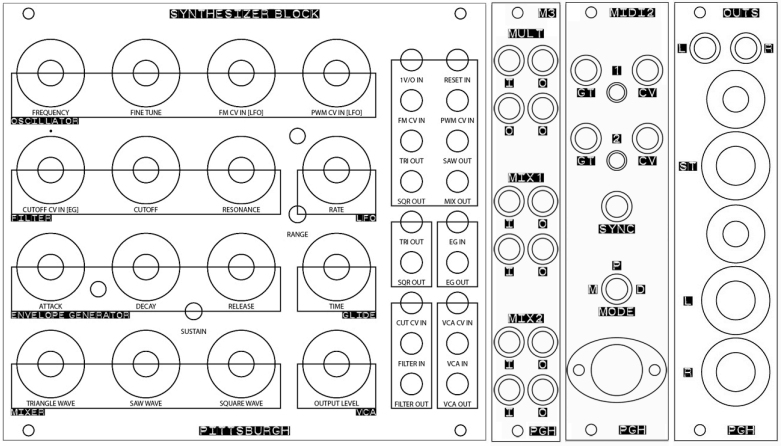
Adjust the Cutoff, Resonance, and Cutoff CV In along with the LFO Rate, FM CV In and PWM CV In and Envelope Generator controls to shape the sound.

Plug in a midi cable connected to a midi keyboard or DAW to control the pitch and gate. This patch takes advantage of the internal routing between the Gate1 and CV1 outputs of the Midi2 module with the EG Input and 1V/O Input of the Synthesizer Block. No patch cables are needed to use this patch.



Plug in a pair of headphones and/or use the 1/4” output jacks into the Outs module to listen to the patch. This patch takes advantage of the internal routing between the VCA Output of the Synthesizer Block and the left input of the Outs module.

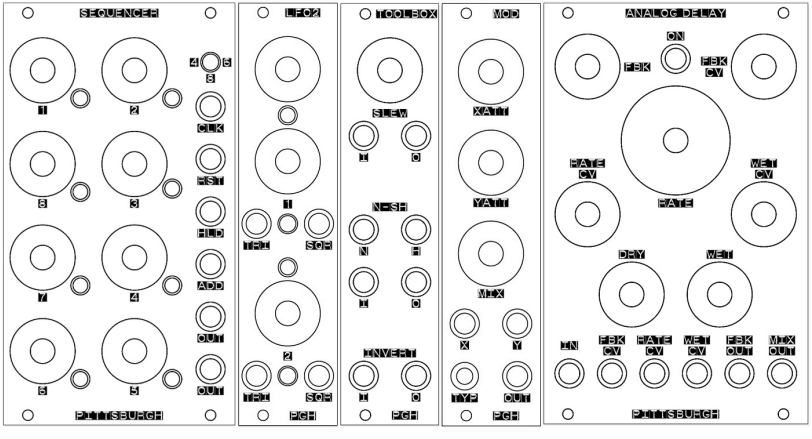
Cell[48] System 1 - Custom Patch Sheet



Cell[48] System 2 Patch Examples

Patch examples using the Cell[48] System 2.

System 2 does not use internal patches.

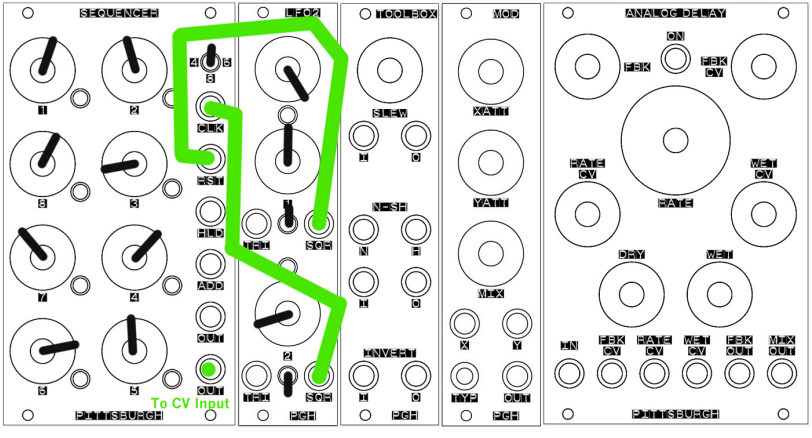


Cell[48] System 2 · Sequencer Test

The Sequencer Test patch uses a square wave from the LFO2 to clock the Sequencer module. A second square wave is used to reset the Sequencer module to step 1.

Adjust the Sequencer steps and LFO rates to shape the control voltage (CV) output.

The output of this patch is a control voltage signal from the Sequencer module that can be used to control the pitch of an Oscillator, modify the cutoff frequency of a Filter, or sent to a CV input of any module.

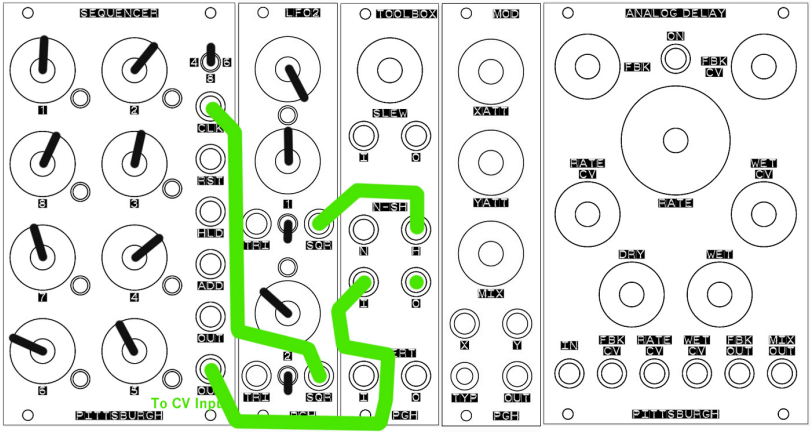


Cell[48] System 2 -Random Sequencer

The Random Sequencer patch uses a square wave from the LFO2 to clock the Sequencer module. The output of the Sequencer is sent to the Sample & Hold section of the Toolbox module. The Sample & Hold is triggered using a square wave from LFO module. The resulting control voltage signal is a semi-random sequence based off the steps of the Sequencer module.

Adjust the Sequencer steps and LFO rates to shape the control voltage (CV) output.

The output of this patch is a control voltage signal from the Toolbox module that can be used to control the pitch of an Oscillator, modify the cutoff frequency of a Filter, or sent to a CV input of any module.

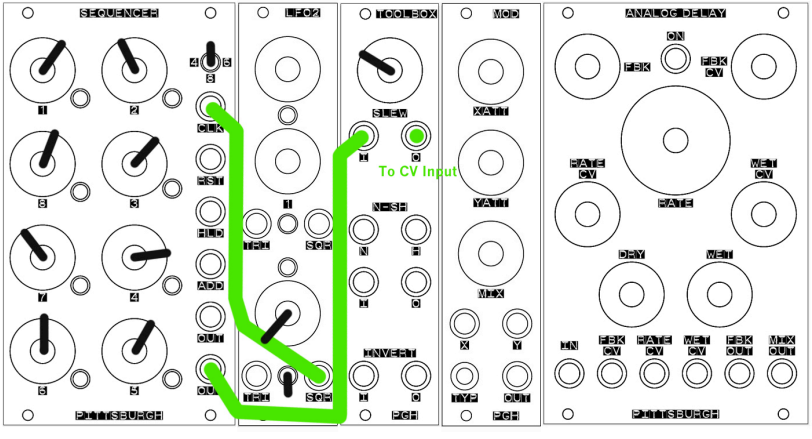


Cell[48] System 2 -Slew Test

The Slew Test patch uses a square wave from the LFO2 to clock the Sequencer module. A second square wave is used to reset the Sequencer module to step 1. The output of the Sequencer is sent to the Slew input of the Toolbox module.

Adjust the Sequencer steps, LFO rates, and Slew time to shape the control voltage (CV) output.

The output of this patch is a control voltage signal from the Toolbox module that can be used to control the pitch of an Oscillator, modify the cutoff frequency of a Filter, or sent to a CV input of any module.

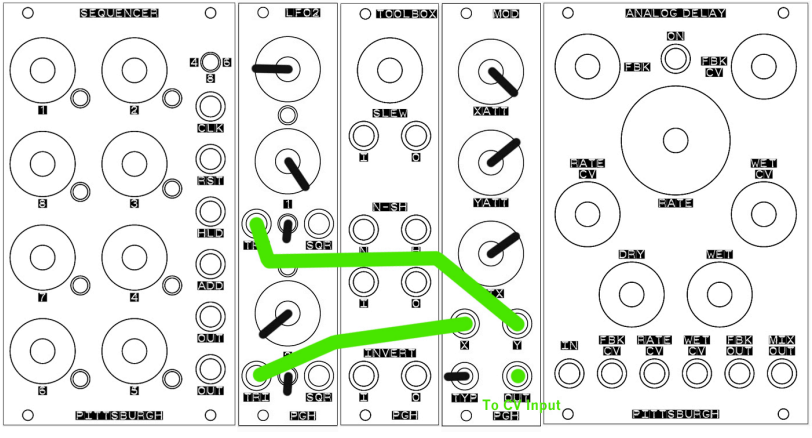


Cell[48] System 2 - Ring Modulator CV Processing

The Ring Modulator CV Processing patch uses the triangle waves from the LFO2 as the X & Y inputs of the Mod (ring modulator) module.

Adjust the Mod controls and LFO rates to shape the control voltage (CV) output.

The output of this patch is a control voltage signal from the Mod module that can be used to control the pitch of an Oscillator, modify the cutoff frequency of a Filter, or sent to a CV input of any module.

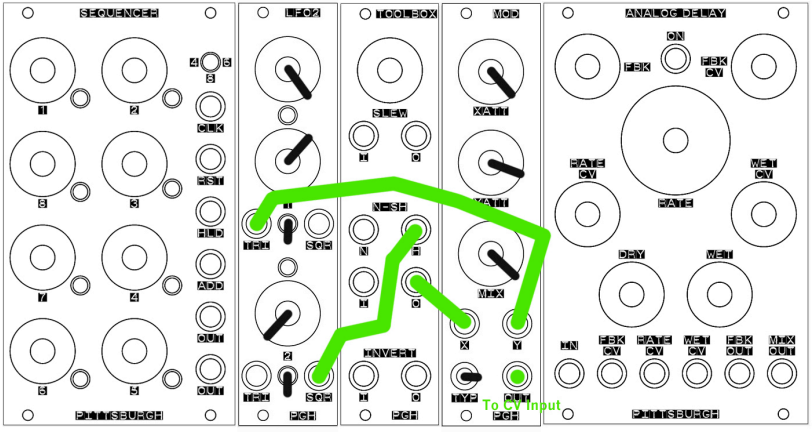


Cell[48] System 2 · Sample & Hold Modified

The Sample & Hold Modified patch uses a square wave from the LFO2 module to trigger the Sample and Hold section of the Toolbox module. The output of the Toolbox module is sent to the X input of the Mod module. A triangle wave from the LFO2 to sent into the Y input of the Mod module.

Adjust the Mod controls and LFO rates to shape the control voltage (CV) output.

The output of this patch is a control voltage signal from the Mod module that can be used to control the pitch of an Oscillator, modify the cutoff frequency of a Filter, or sent to a CV input of any module.

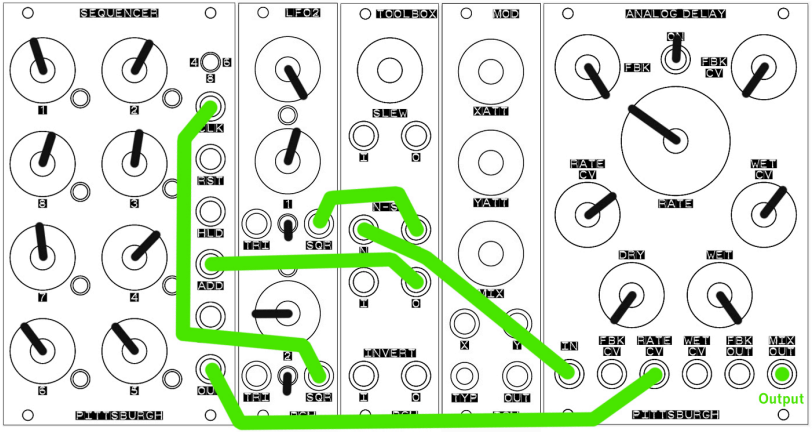


Cell[48] System 2 - Broken Fan Belt

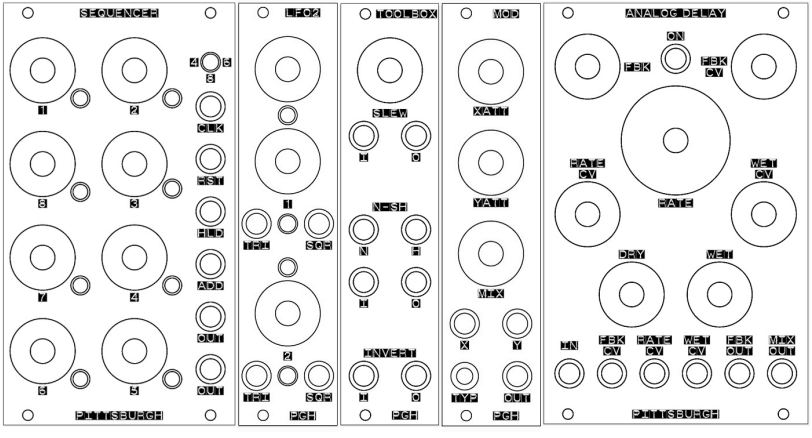
The Broken Fan Belt patch uses a square wave from the LFO2 module to clock the Sequencer. A second square wave from the LFO2 module is used to trigger the Sample and Hold section of the Toolbox module. The output of the Toolbox module is sent to the Add input of the Sequencer module. The output of the Sequencer is sent to the Rate CV input of the Analog Delay module. The Noise output of the Toolbox is used to seed the Analog Delay self oscillation.

Adjust the Sequencer controls, LFO rates, and Analog Delay Rate and Rate CV knobs to control the audio output.

The output of this patch is a audio signal from the Mix Out of the Analog Delay module.



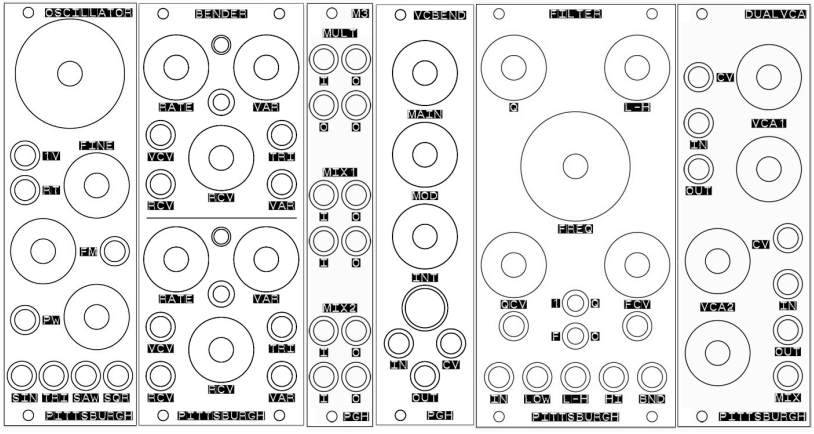
Cell[48] System 2 · Empty Patch Sheet



Cell[48] System 3 Patch Examples

Patch examples using the Cell[48] System 3.

System 3 does not use internal patches.

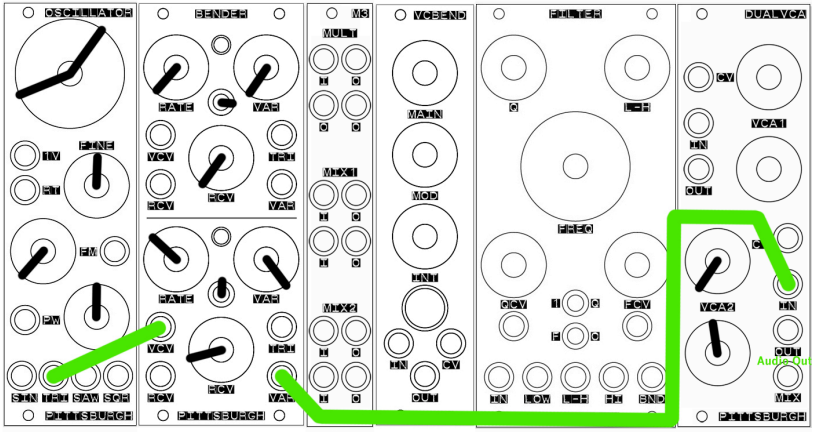


Cell[48] System 3 · Bender Test

The Bender Test patch uses a triangle wave from the Oscillator to control the variable waveform of the lower LFO of Bender module. The frequency of the lower LFO is being modulated within the Bender module using the upper LFO of the Bender module. The variable output of the lower LFO is sent to the input of the Dual VCA module.

Adjust the Oscillator controls, Upper and lower LFO Bender controls, and Dual VCA knobs to control the audio output.

The output of this patch is a audio signal from the Output of the Dual VCA module.

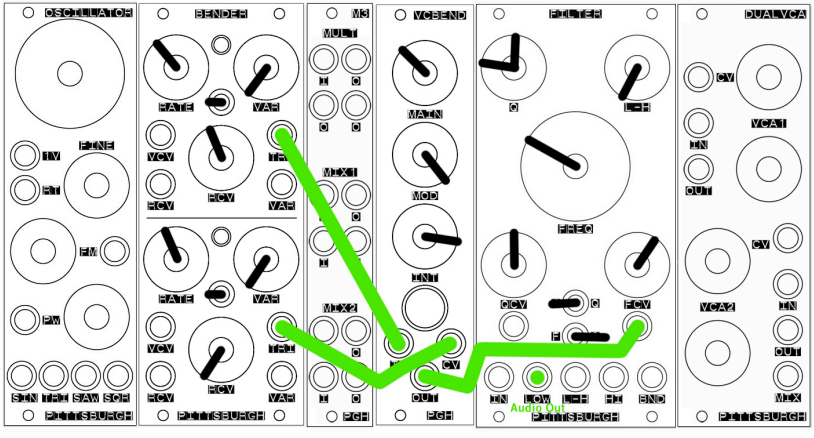


Cell[48] System 3 ·Complex Modulation

The Complex Modulation patch uses a triangle wave from the upper LFO of the Bender sent to the VC Bend module. The triangle wave from the lower LFO of the Bender module is sent to the CV input of the VC Bend module. The output of the VC Bend is sent to the Frequency CV input of the Filter module. The Filter module is set to self oscillate.

Adjust the Upper and lower LFO Bender controls, Filter Q, Frequency, and FCV controls to control the audio output.

The output of this patch is a audio signal from the Low output of the Filter module.

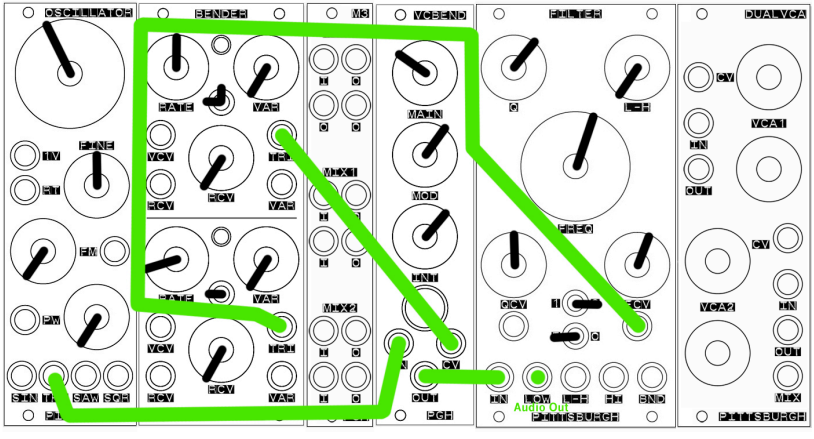


Cell[48] System 3 -Drone Base

The Drone Base patch uses a triangle wave from the Oscillator module sent to the VC Bend. The triangle output of the upper LFO of the Bender sent to the CV input of the VC Bend module. The output of the VC Bend is sent to the input of the Filter module. The triangle wave from the lower LFO of the Bender module is sent to the FCV input of the Filter module.

Adjust the Oscillator frequency, Upper and lower LFO Bender controls, VC Bend controls, Filter Q, Frequency, and FCV controls to control the audio output.

The output of this patch is a audio signal from the Low output of the Filter module.

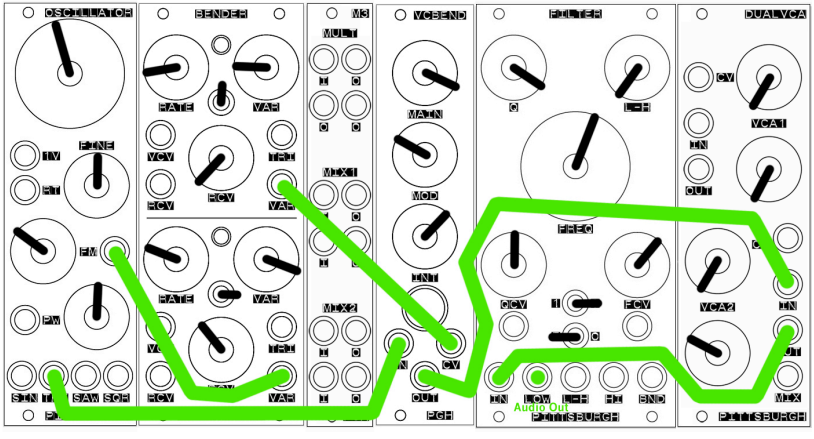


Cell[48] System 3 - Propeller

The Propeller patch uses a triangle wave from the Oscillator module sent to the VC Bend. The variable output of the upper LFO of the Bender sent to the CV input of the VC Bend module. The variable wave from the lower LFO of the Bender module is sent to the FM input of the Oscillator module. The output of the VC Bend is sent to the input of the Dual VCA module. The output of the Dual VCA is sent to the input of the Filter Module.

Adjust the Oscillator frequency and FM amount, Upper and lower LFO Bender controls, VC Bend controls, Dual VCA level, Filter Q and Frequency controls to control the audio output.

The output of this patch is a audio signal from the Low output of the Filter module.

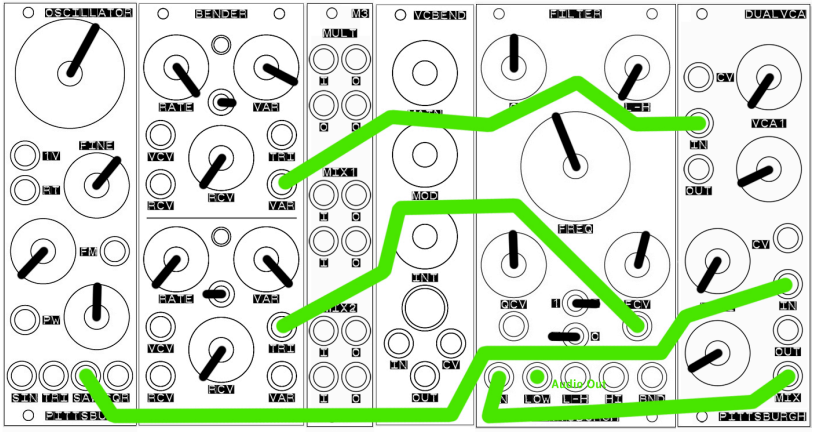


Cell[48] System 3 -Basic Soundscape

The Basic Soundscape patch mixes the saw output of the Oscillator module and the Variable output of the upper LFO of the Bender module using the Dual VCA module. The output of the Dual VCA is sent to the input of the Filter module. The triangle wave from the lower LFO of the Bender is used to modulate the frequency CV input of the Filter module.

Adjust the Oscillator frequency, Upper and lower LFO Bender controls, Dual VCA levels, Filter Q and Frequency controls to control the audio output.

The output of this patch is a audio signal from the Low output of the Filter module.

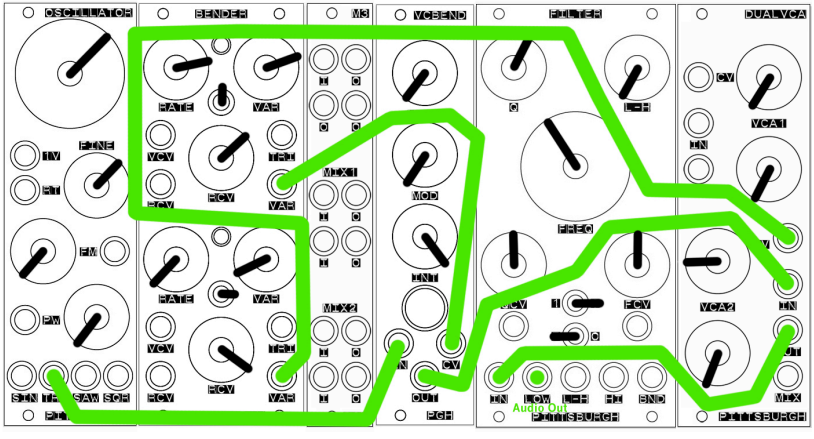


Cell[48] System 3 - Innertubes

The Innertubes patch mixes the triangle output of the Oscillator module and the Variable output of the upper LFO of the Bender module using the VC Bend module. The output of the VC Bend is sent to the input of the Dual VCA module. The variable wave from the lower LFO of the Bender is used to modulate the output level of the Dual VCA. The output of the Dual VCA is sent to the input of the Filter module.

Adjust the Oscillator frequency, Upper and lower LFO Bender controls, VC Bend controls, Dual VCA level, Filter Q and Frequency controls to control the audio output.

The output of this patch is a audio signal from the Low output of the Filter module.

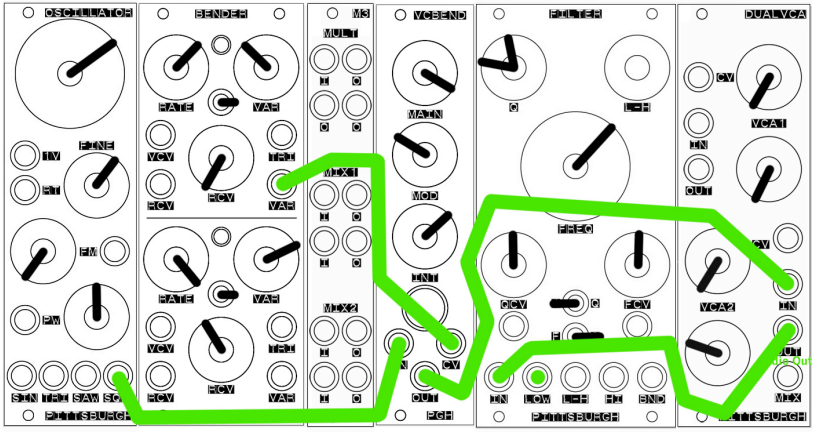


Cell[48] System 3 -Distortion Machine

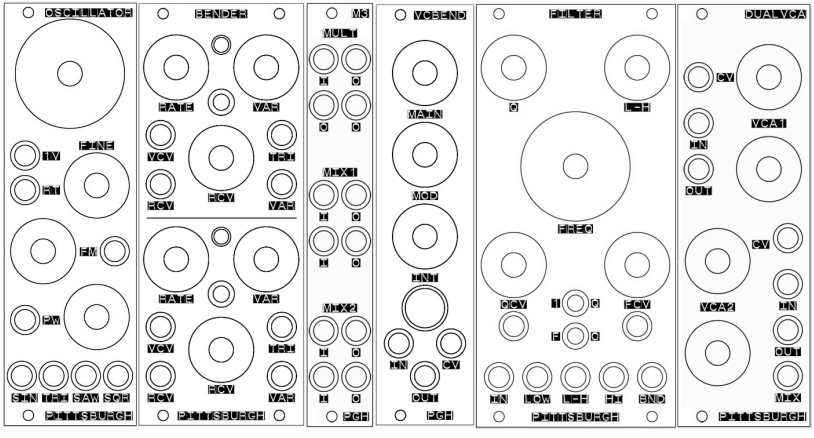
The Distortion Machine patch mixes the square output of the Oscillator module and the Variable output of the upper LFO of the Bender module using the VC Bend module. The output of the VC Bend is sent to the input of the Dual VCA module. The output of the Dual VCA is sent to the input of the Filter module. The Filter module is set to self oscillate.

Adjust the Oscillator frequency, Upper and lower LFO Bender controls, VC Bend controls, Dual VCA level, Filter Q and Frequency controls to control the audio output.

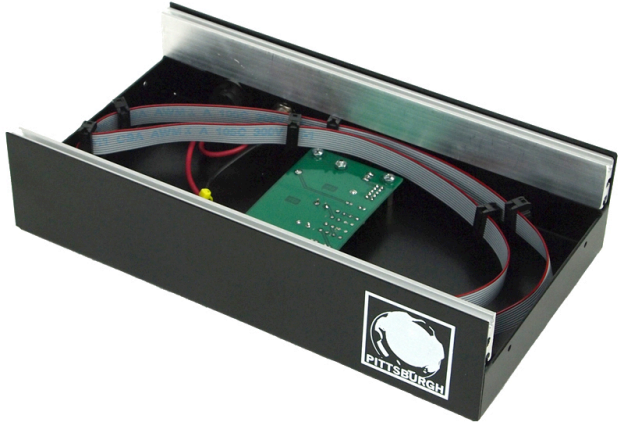
The output of this patch is a audio signal from the Low output of the Filter module.



Cell[48] System 3 · Empty Patch Sheet

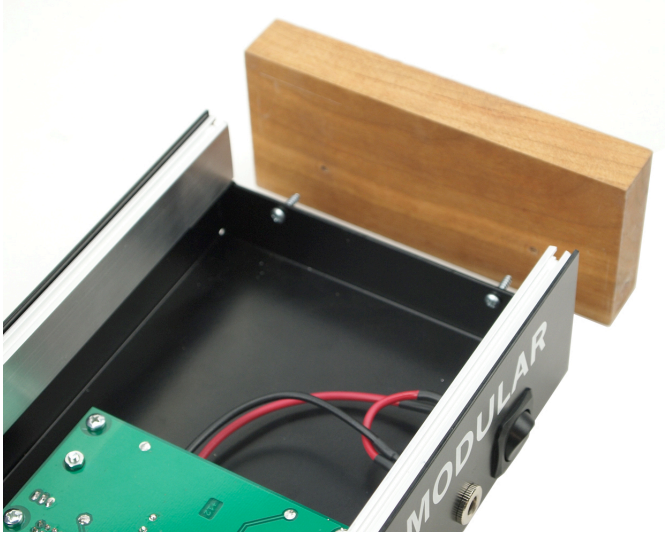


Cell[48] Case - Information



The Cell[48] Systems ship in a Cell[48] Case. The Cell [48] is a small, expandable, desktop eurorack case and power supply. A custom designed, heavy duty steel frame matched with replaceable sides. The desktop cases can be configured in single or double row configurations. Frames and wood sides can be separated to allow for easy expandability and customizing.

Cell[48] Case - Attaching Single Row Wood Sides



Warning: Before attaching the wood sides, all modules must be removed from the steel frame.

Attaching Single Row Wood Sides

1. Line up the holes on one side of the steel frame with the holes on the wood side.
2. Use the included screws to attach the wood side to the steel frame.
3. Repeat for the 2nd side.

Cell[48] Case - Attaching Double Row Wood Sides

Cases should be attached to double row sides so the back of both cases face each other. This keeps the power buttons close to each other and hides the power adapter cables.

Attaching Double Row Wood Sides

1. Lay wood down on smooth surface with holes facing up.
2. Line up the holes of the bottom frame so the Pittsburgh Modular Logo faces front.
3. Use the included screws to attach the wood side to the steel frame.
4. Line up the holes of the top frame so the Pittsburgh Modular Logo faces the top.
5. Use the included screws to attach the wood side to the steel frame.
6. Repeat for the 2nd wood side.

Cell[48] Case - Adding New Modules

The Cell[48] Case is designed to hold up to 9 modules. Adding new modules to the case is a simple process. Please follow the instructions below to ensure that new modules are installed safely and correctly.

Modules in double row systems can be oriented to allow the synthesizer to stand up taller or lay down flatter depending on which direction the modules are installed. Experiment with system layout by resting a few modules in the case before installation.

1. Switch the power off and unplug the power adapter from the back of the case.
2. If the new module has a ribbon cable attached, note the orientation of the stripe and remove the cable and set it aside. Taking a picture before removing the cable is an easy way to keep track of the proper cable orientation. The stripe on a ribbon cable marks the NEGATIVE VOLTAGE and must be attached to the -12v of the power supply.
3. Modules can use either a 10pin or 16pin power header. The custom power ribbon cable included with the case has both. Choose the correct size power header from the power ribbon cable and attach it to the module. The red stripe on the ribbon cable marks -12v. This stripe needs to line up with the -12v pins on the module. Failure to match up the pins correctly can result in damage to one or all the modules connected to the power supply.
4. Use a small tool to line up the needed sliding nuts close to where the module will be mounted.
5. Attach the module to the sliding nuts using the included panel screws. If installing more than 1 module, do not tighten down the panel screws until all the modules are installed. This will allow some room to shift the modules as needed.
6. Repeat steps 2-5 for each new module.
7. Once all the new modules are installed, plug in the power adapter and switch on the case. Carefully test each module to ensure it is working as expected.

Cell[48] Case - Removing Modules

Removing modules from the Cell[48] Case is easy however, please follow the instructions below to ensure that modules are removed safely and correctly.

1. Switch the power off and unplug the power adapter from the back of the case.
2. Unscrew the panel screws of the module to be removed.
3. Carefully lift the module from the case until the power header is accessible.
4. Note the orientation of the stripe on the ribbon cable then remove the power header. Taking a picture before removing the cable is an easy way to keep track of the proper cable orientation. The stripe on a ribbon cable marks the NEGATIVE VOLTAGE and must be attached to the -12v of the power supply.
5. Repeat steps 2-4 for each module to be removed.

Warranty

1 Year Limited Warranty:

For a period of one year after the date of original purchase, the instrument and all factory installed parts and modules manufactured by Pittsburgh Modular Synthesizers LLC. are warranted to function properly and be free of defects in materials and workmanship. Should a factory installed module fail during the warranty period, contact Pittsburgh Modular Synthesizers. LLC. We will repair it (or at our option, replace it) at no charge, and pay the cost of shipping it back to you.

The case and all case related hardware are warranted to function properly and be free of defects in materials and workmanship for 1 year.

Patch Cables are not covered by the 1 Year Limited Warranty.

This warranty is void if in our opinion the instrument has been damaged by accident, mishandled, altered, improperly serviced, or repaired by the customer where such treatment has affected its performance or reliability. This includes but is not limited to damage related to incorrectly attaching power ribbon cables. In the event of such misuse/abuse by the customer, costs for repairs plus two-way shipping costs will be borne by the customer. Instruments found defective should be returned to the factory carefully packed, as the customer will be responsible for freight damage.

Incidental or consequential damages or costs incurred as a result of product malfunction are not the responsibility of Pittsburgh Modular Synthesizers LLC.

Service and Information

Please contact us for service or other information.

info@pittsburghmodular.com

www.pittsburghmodular.com/contact/