

structure 344 pittsburgh modular synthesizers

pittsburgh modular synthesizers structure 344 manual

Thank You!

Thank you for purchasing the Structure 344. Your investment in our ideas help support innovative, boutique eurorack design.

Michael Importico and I are very proud of this design and the work our woodshop has put into creating a beautiful eurorack enclosure. The Structure 344 represents the best of everything we have learned in the past 8 years designing and building eurorack cases.

I would like to thank Steve Rightnour of Monorocket for helping Pittsburgh Modular get started many years ago. Steve's kindness with his time, innovative ideas, and never ending quest for improvement influence our work to this day.

The Structure 344 is meant to inspire. Please use this case to build a synthesizer pushes your music forward.

Enjoy,
Richard Nicol
Founder | Product Design
Pittsburgh Modular Synthesizers

Important Information

Read Instructions: Please read the Structure 344 manual completely before use and retain for future reference.

- **WARNING! ALWAYS TURN OFF AND UNPLUG THE CASE BEFORE ADDING OR REMOVING MODULES.** Incorrectly installed modules can cause damage to the case and other modules. Double check the orientation of the power ribbon cable before plugging in and turning on the case.
- **WARNING! ALWAYS FILL UNUSED PANEL SPACE WITH BLANK PANELS.** Stray patch cables touching the power headers can cause damage to the case and modules. Always cover empty rack spaces with blank panels. Do not attempt to repair the Structure 344. Please contact Pittsburgh Modular regarding malfunctions of any kind.
- Only use the IEC power adapter provided by Pittsburgh Modular with the Structure 344. Using an incorrect power adapter can cause permanent damage to the Structure 344 and any attached modules.
- The Structure 344 is an electronic device. Exposure to water will cause the Structure 344 circuitry to short circuit and may cause permanent damage to the Structure 344 and any attached modules.
- Do not attempt to modify the Structure 344. Tampering with the circuitry may cause permanent damage to the Structure 344 and any attached modules.
- Pittsburgh Modular is not responsible for any damage or loss to the Structure 344 or any attached modules caused by improper use of the Structure 344.



Table of Contents

1. Utility Bridge User Interface Map.....	Page 6
2. Utility Bridge Sections, Connections and Signals.....	8
3. Utility Bridge Interface Conventions.....	10
4. Utility Bridge Internal Signal Routing.....	12
5. Utility Bridge Internal Signal Routing Map.....	14
6. Individual Utility Bridge Sections.....	16
7. Utility Bridge Preamp.....	18
8. Utility Bridge Mix/Mult.....	20
9. Utility Bridge Voltage Controlled Mixer Bus.....	22
10. Utility Bridge Bus Outputs.....	26
11. Utility Bridge Signal Attenuators.....	28
12. Installing and Removing Eurorack Modules.....	30
13. Structure 344 Power Supply.....	32
14. Service and Other Information	34
15. Warranty.....	35

1. Structure 344 Utility Bridge User Interface Map

Preamp

1. **Preamp Gain Knob** - Set the preamp drive gain.
2. **Preamp Input Jack** - Audio signal input jack.
3. **Preamp Output Jack** - Audio signal output jack.

Mix/Mult

4. **Input Jack** - Audio or CV signal input.
5. **Input Jack** - Audio or CV signal input.
6. **Mix Output Jack** - Audio or CV signal mix output.
7. **Mix Output Jack** - Audio or CV signal mix output.
8. **Mix Output Jack** - Audio or CV signal mix output.
9. **Mix Output Jack** - Audio or CV signal mix output.

Voltage Controlled Mixer Bus A

10. **In 1 Level Attenuverter Knob** - Signal input level normaled to +5v.
11. **In 1 Jack** - Audio or CV signal input.
12. **Out 1 Jack** - Audio or CV signal output.
13. **In 2 Level Attenuverter Knob** - Signal input level controller.
14. **In 2 Jack** - Audio or CV signal input.
15. **Out 1 Jack** - Audio or CV signal output.
16. **CV | Output Level Attenuator Knob** - Set Bus A output level.
17. **In 3 Jack** - Audio or CV signal input.
18. **CV Jack** - Bus A output level CV control input.

Bus Outputs

19. **Bus Selector Button** - Select Bus A (out) or B (in).
20. **Bus Output Jack** - Selected bus signal output.
21. **Bus Selector Button** - Select Bus A (out) or B (in).
22. **Bus Output Jack** - Selected bus signal output.
23. **Bus Selector Button** - Select Bus A (out) or B (in).
24. **Bus Output Jack** - Selected bus signal output.

Bus Mixer

25. **Or Output Jack** - Analog or mix of Bus A and Bus B.
26. **And Output Jack** - Mix of Bus A and Bus B.
27. **Inverted Output Jack** - Inverted mix of Bus A and Bus B.

Bus Outputs

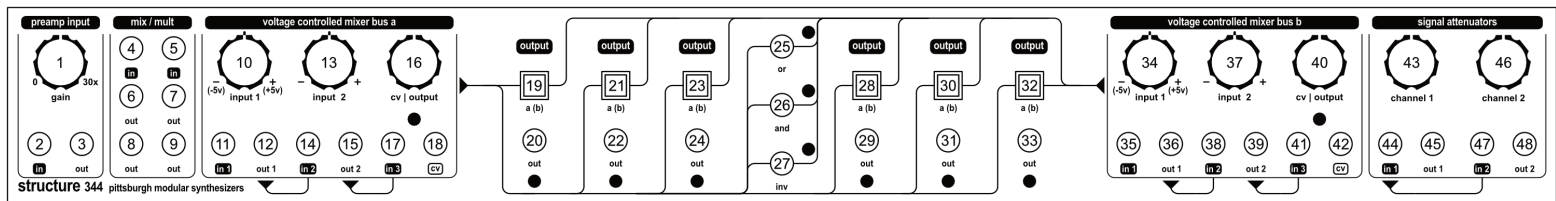
28. **Bus Selector Button** - Select Bus A (out) or B (in).
29. **Bus Output Jack** - Selected bus signal output.
30. **Bus Selector Button** - Select Bus A (out) or B (in).
31. **Bus Output Jack** - Selected bus signal output.
32. **Bus Selector Button** - Select Bus A (out) or B (in).
33. **Bus Output Jack** - Selected bus signal output.

Voltage Controlled Mixer Bus B

34. **In 1 Level Attenuverter Knob** - Signal input level normaled to +5v.
35. **In 1 Jack** - Audio or CV signal input.
36. **Out 1 Jack** - Audio or CV signal output.
37. **In 2 Level Attenuverter Knob** - Signal input level controller.
38. **In 2 Jack** - Audio or CV signal input.
39. **Out 1 Jack** - Audio or CV signal output.
40. **CV | Output Level Attenuator Knob** - Set Bus B output level.
41. **In 3 Jack** - Audio or CV signal input.
42. **CV Jack** - Bus B output level CV control input.

Signal Attenuators

43. **Channel 1 Level Attenuator** - Adjust the output level of channel 1.
44. **Channel 1 Input Jack** - Audio or CV signal input.
45. **Channel 1 Output Jack** - Audio or CV signal output.
46. **Channel 2 Level Attenuator** - Adjust the output level of channel 2.
47. **Channel 2 Input Jack** - Audio or CV signal input.
48. **Channel 2 Output Jack** - Audio or CV signal output.



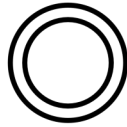
2. Structure 344 Utility Bridge Sections, Connections and Signals

The Structure 344 Utility Bridge is meant to integrate with attached eurorack format modules to create a patchable, analog synthesizer. The Utility Bridge combines the functionality of 6 individual synthesizer sections.

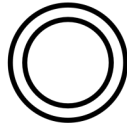
1. **Preamp**
2. **Mix/Mult**
3. **Voltage Controlled Mixer Bus A**
4. **Bus Outputs**
5. **Voltage Controlled Mixer Bus B**
6. **Signal Attenuators**

The sections were selected to enhance the functionality of attached eurorack modules by including a deep set of tools that will be useful in every patch. Each section will be covered in detail to fully unlock the available signal routing potential.

All Utility Bridge sections can be used to process both audio signals and control voltages.



CV



audio



attenuator



attenuverter



cv



signal



output

3. Structure 344 Utility Bridge Interface Conventions

The Structure 344 Utility Bridge uses several simple labeling conventions to make the user interface and signal flow easy to understand. The labeling is meant as a starting point and not a definitive rule. Experimentation is key.

Large white outlines are used to separate individual function sections such as the Mix/Mult and the Voltage Controlled Mixer Bus A.

Internal signal paths are shown using an arrow pointing in the direction of the signal followed by a line leading to the signal destination. Internal signal paths can be rerouted using the jacks.

There are two types of CV trimmers. An attenuator knob starts at zero signal when turned full left and at full right it is outputting the full signal level. The zero point for an attenuverter knob is at 12 o'clock. Turning an attenuverter full left outputs an inverted version of the full signal level and turning an attenuverter full right outputs a non-inverted version of the full signal level.

CV input jacks are labeled using text surrounded by a outline.

Signal input jacks are labeled using text surrounded by a solid background.

Output jacks are simply labeled using text.

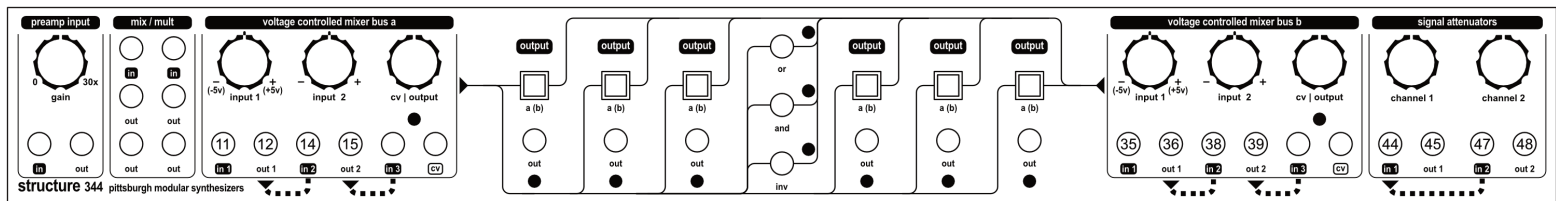
Any output can be patched into any input. Some patching may not result in musical or interesting results but experimentation with the patch points is always encouraged.

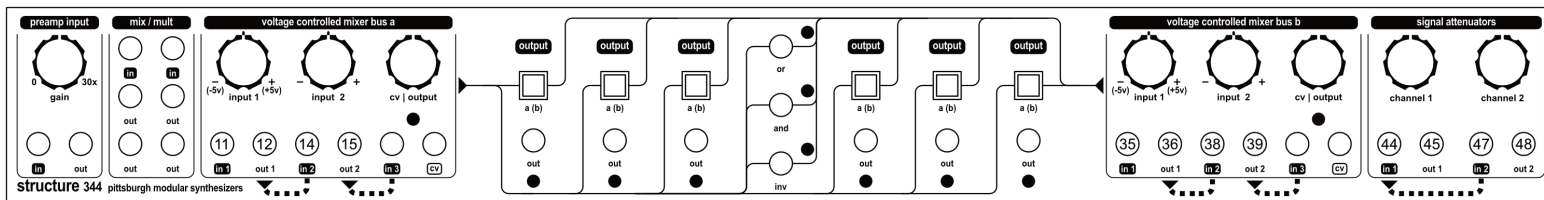
4. Structure 344 Utility Bridge Internal Signal Routing

The Structure 344 Utility Bus utilizes flexible internal connections to simplify patching and extend the functionality of the Utility Bus. To modify the internal routing or to create something completely new, all of the internal routing can be bypassed using the jacks. This allows total patching freedom without the constraints of a fixed signal flow.

Most internal connections are made using switched jacks. A switched jack allows the internal signal path to be cut when a patch cable is inserted. A simple example would be Input 1 of Voltage Controlled Mixer Bus A. Internally, the output of Input 1 is sent to the Voltage Controlled Mixer where it is mixed with Input 2 and Input 3 and output via the Bus outputs. When a patch cable is plugged into the Input 1 output, that patch cable breaks the connection to the mixer thus removing it from the Bus A outputs and creating a single channel attenuverter.

The internal signal routing of the Utility Bus is clearly marked on the panel using arrows and lines pointing toward the signal destination. **Plugging a patch cable into an internally patched input jack will override any internal patching allowing for full patching flexibility.**





5. Structure 344 Utility Bridge Internal Signal Routing Map

a. Voltage Controlled Mixer Bus A Input 1 Output

Input 1 signal (11) sent from the Input 1 output (12) to the Voltage Controlled Mixer Bus A outputs.

b. Voltage Controlled Mixer Bus A Input 2 Output

Input 2 signal (14) sent from the Input 1 output (15) to the Voltage Controlled Mixer Bus A outputs.

c. Voltage Controlled Mixer Bus B Input 1 Output

Input 1 signal (35) sent from the Input 1 output (36) to the Voltage Controlled Mixer Bus B outputs.

d. Voltage Controlled Mixer Bus B Input 2 Output

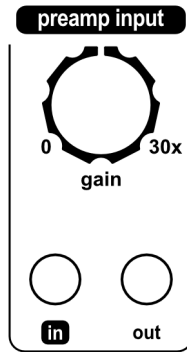
Input 2 signal (38) sent from the Input 1 output (39) to the Voltage Controlled Mixer Bus B outputs.

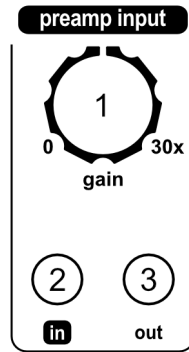
E. Signal Attenuators Input 1 Output

Input 1 signal (44) sent from the Input 1 output (45) to the Input 2 input (47).

6. Individual Utility Bridge Sections

The Utility Bridge is comprised of 6 individual function sections. The following pages will explain the features of these sections.





7. Utility Bridge Preamp

The Gain Knob (1) controls the preamp for processing external or internal signals. The Gain Knob (1) offers up to 30x gain with integrated soft clipping overdrive. Perfect for processing external signals or overdriving internal waveforms.

Preamp Patching Notes

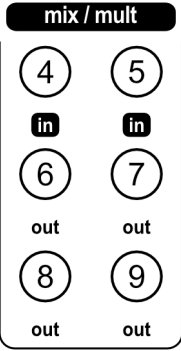
- The preamp can be used to raise the signal level of line level audio from external synths, guitars, or other audio sources.
- Pass eurorack level signals through the preamp to overdrive the signal.

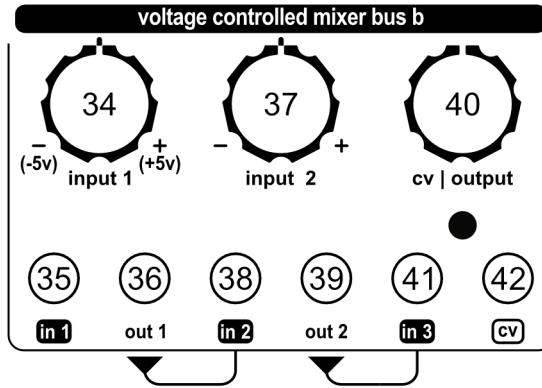
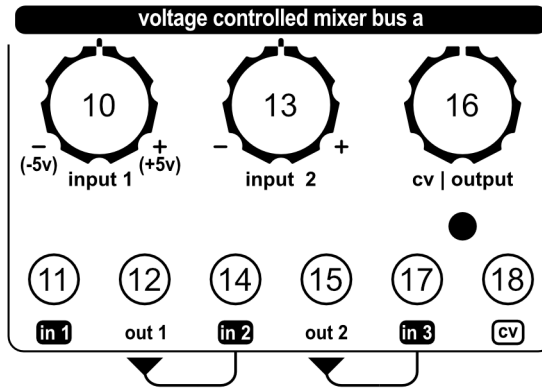
8. Utility Bridge Mix/Mult

The Mix/Mult is an active audio and CV interchange simultaneously splitting and mixing the incoming signals. This section can be used as a two channel mixer, buffered signal splitter, or both. The Inputs (4,5) create a two channel unity gain mixer. The Outputs (6,7,8,9) are four identical, individually buffered copies of the incoming audio or CV signal(s). The Mix/Mult is perfect for pitch sensitive CV signals.

Mix Mult Patching Notes

- The Mix/Mult works great for both audio and CV signals.
- Patch both Inputs (4,5) to use the Mix/Mult as a two channel unity gain mixer.
- Patch one Input (4 or 5) and multiple Outputs (6,7,8,9) to use the Mix/Mult as a buffered signal splitter.
- Patch both Inputs (4,5) and multiple Outputs (6,7,8,9) to use the Mix/Mult as both a unity gain mixer and buffered signal splitter.





9. Utility Bridge Voltage Controlled Mixer Bus

Voltage Controlled Mixer Bus A and Voltage Controlled Mixer Bus B are functionally identical and will both be covered by the following information. For clarity, references will be made to Bus A but the information applies equally to the corresponding Bus B.

The Voltage Controlled Mixer Bus combines two main functions, a three channel mixer and a VCA but because of the signal flow design, the available feature set of the Voltage Controlled Mixer Bus is very deep. The output of the three channel mixer is sent through the VCA to the bus a outputs. The mixer and VCA be broken apart and used simultaneously as several simple utility functions.

Mixer Features

The three channel mixer can be utilized for both audio and CV signals. The signal path of the mixer is extremely flexible allowing it to function in four different configurations. Patching the output of Input 1 and/or Input 2 will remove the Input(s) from the mixer circuit. This isolates the input channel creating a buffered attenuverter.

Input 1 (no signal patched in)

Input 1 is normaled to +5v allowing for adjustable DC offset. The Input 1 Attenuverter Knob (10) is used to adjust this voltage anywhere from -5v (Input 1 knob full left) to 0v (Input 1 knob @ 12 o'clock) to +5v (Input 1 knob full right). Patching into Output 1 (12) removes input 1 from the mixer creating a stand alone DC offset.

Input 1 (signal patched in)

If a signal is patched into input 1, the 5v normaling is removed and replaced by the patched signal. The Input 1 Attenuverter Knob (10) is used to attenuate and/or invert the input signal anywhere from full inversion (Input 1 Knob full left) to no signal (Input 1 Knob @ 12 o'clock) to full signal (Input 1 Knob full right). Patching into Output 1 (12) removes input 1 from the mixer creating a stand alone signal attenuverter.

Input 2

The Input 2 Attenuverter Knob (13) is used to attenuate and/or invert the input signal anywhere from full inversion (Input 2 Knob full left) to no signal (Input 2 Knob @ 12 o'clock) to full signal (Input 2 Knob full right). Patching into Output 2 (15) removes Input 2 from the mixer creating a stand alone signal attenuverter.

Input 3

The input 3 (17) is sent to the mixer at unity gain. Input 3 does not have a dedicated attenuator or attenuverter knob to control the level.

9. Utility Bridge Voltage Controlled Mixer Bus (continued)

VCA Features

The output of the three channel mixer is sent internally to the embedded VCA. The output level of the VCA is controlled in one of two ways.

With nothing patched into CV Input

If nothing is patched into the CV input (18) the VCA level is controlled manually using the CV|Output Knob (16).

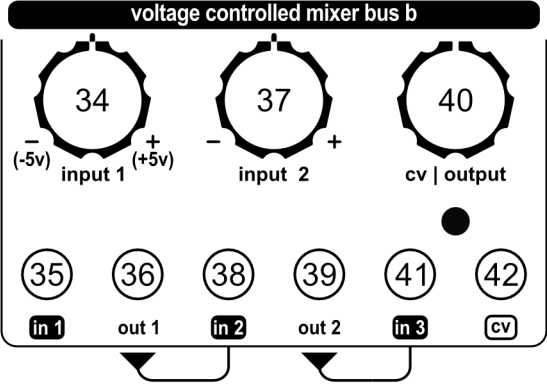
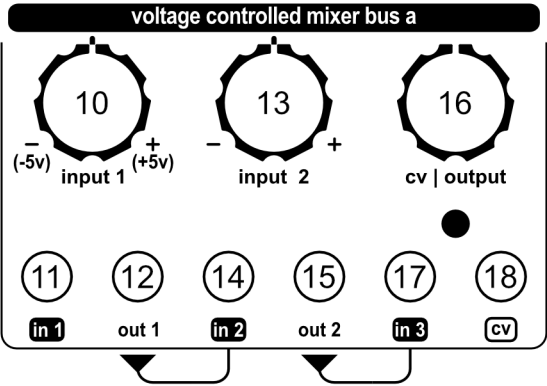
With a signal patched into CV Input

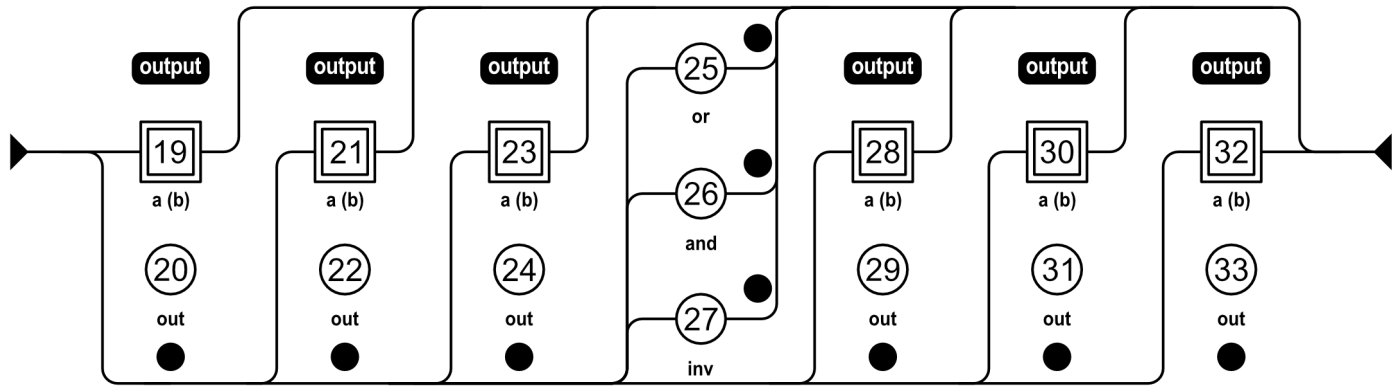
If a signal is patched into the CV Input (18) the CV|Output Knob (16) functions as an attenuator for the incoming CV signal controlling the level of the CV input.

The output of the VCA is sent to the Bus Outputs section.

Voltage Controlled Mixer Bus Patching Notes

- The normalized voltage (-5v to +5v) can be used as a DC offset source by patching out of Output 1 (12). This removes Input 1 from the mixer allowing Input 2 and Input 3 to be used as a two channel mixer.
- To use the Voltage Controlled Mixer Bus A as single input VCA, patch the audio or CV signal to be processed into Input 1 (10) and turn the Input 1 Knob full right. Patch the CV control signal into the CV Input (18). Adjust the CV|Output Knob to adjust the level of the CV Input.
- The Voltage Controlled Mixer Bus A can be used as a simple signal distribution system by patching into Input 1 (11) and turning Input 1 Knob (10) full right. Turn the CV|Output Knob (16) full right to open up the VCA. The signal will now be buffered and distributed to all of the Bus A outputs.





10. Utility Bridge Bus Outputs

The Bus Outputs section offers 6 individually buffered outputs assignable to either Bus A or Bus B. To use Bus A, the Output Button should be unpressed and the Button LED should be off. To enable Bus B, the Output Button should be depressed and the Button LED should be lit. The Outputs can be used in any combination of Bus A and Bus B.

The center of the Bus Outputs section combines Bus A and Bus B in 3 different ways.

The Or Output uses an analog logic process to output the highest positive voltage from either Bus A or Bus B. This output is great for creating unique and interesting modulations sources. If only one Bus is being utilized, the Or Output acts as a half wave rectifier, removing the negative edge of outgoing waveforms.

The And Output creates a standard unity gain mix of Bus A and Bus B.

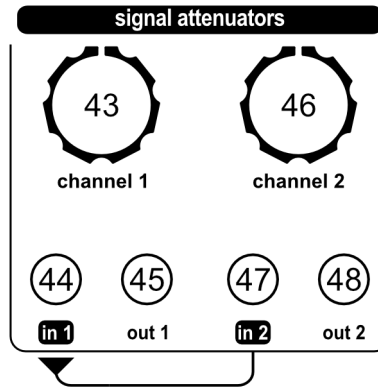
The Inverted Output inverts a mix of Bus A and Bus B.

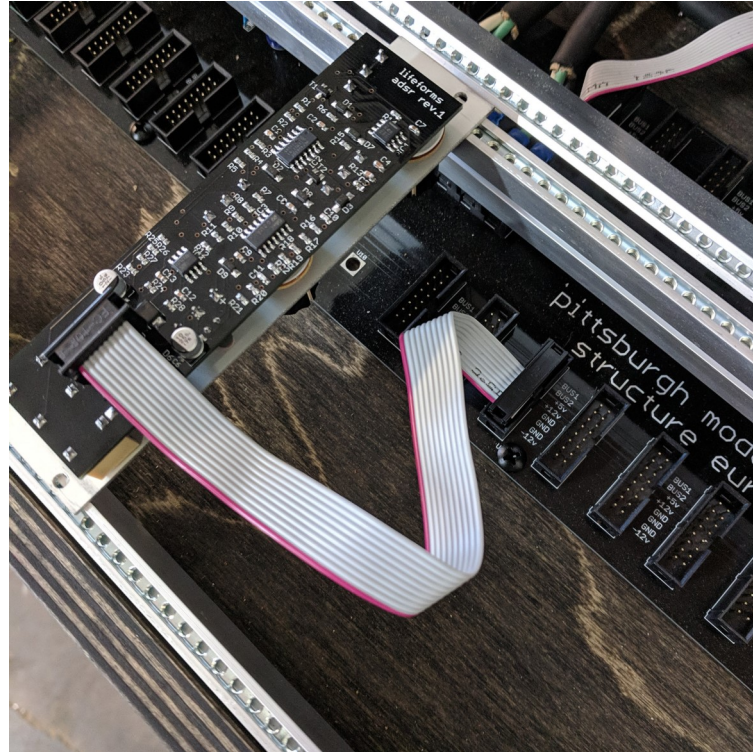
11. Utility Bridge Signal Attenuators

The Signal Attenuators section offers a few different functions. The section can function as two independent signal attenuators by patching signals to Input 1 (44) and Input 2 (47). The section can also be used as a buffered signal splitter with individual attenuation controls. Input 1 (44) is normaled to Input 2 (47) so if no cable is patched into Input 2 (47), the signal from Input 1 (44) is used.

Signal Attenuator Patching Notes

- One of the signal attenuators can be used in conjunction with the preamp to create an FX loop for the synthesizer. Use one of the signal attenuators to drop the signal to the appropriate level for external processing. Use the Preamp section to return the signal back to eurorack levels by raising the gain of the externally processed signal.





12. Installing and Removing Eurorack Modules

Adding New 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.

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. The red stripe on the ribbon 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 of the modules connected to the power supply.
3. Attach the module to the nut strip using the included M3 6mm panel screws.
4. 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 properly.

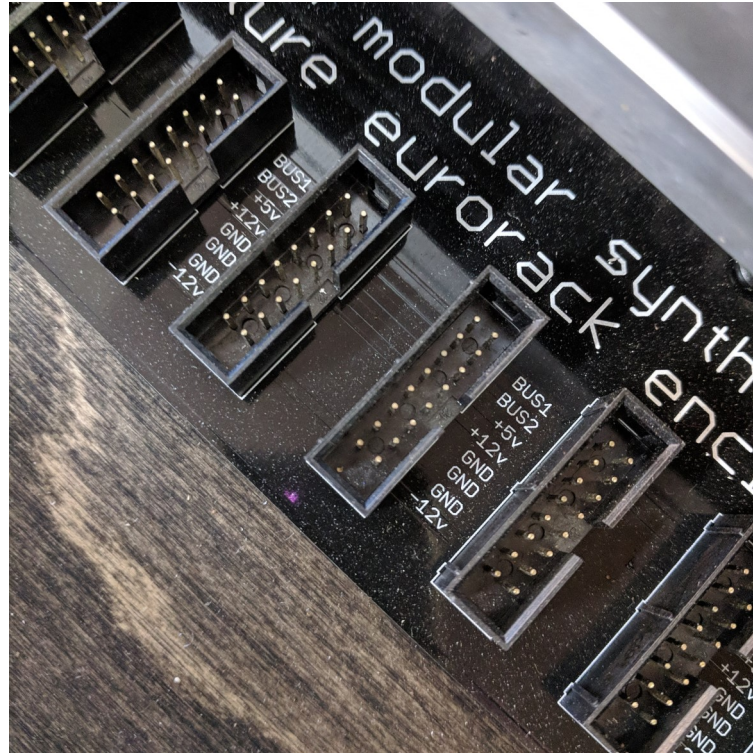
Adding and Removing Eurorack Modules Notes

- **WARNING! ALWAYS TURN OFF AND UNPLUG THE CASE BEFORE ADDING OR REMOVING MODULES.** Incorrectly installed modules can cause damage to the case and other modules. Double check the orientation of the power ribbon cable before plugging in and turning on the case.
- **WARNING! ALWAYS DOUBLE CHECK POWER RIBBON CABLE ORIENTATION AFTER ADDING MODULES.** Incorrectly installed modules can cause damage to the case and other modules. Double check the orientation of the power ribbon cable before plugging in and turning on the case.
- **WARNING! ALWAYS FILL UNUSED PANEL SPACE WITH BLANK PANELS.** Stray patch cables touching the power headers can cause damage to the case and modules. Always cover empty rack spaces with blank panels. Do not attempt to repair the Structure 344. Please contact Pittsburgh Modular regarding malfunctions of any kind.

13. Structure 344 Power Supply

The Structure 344 utilizes a set of 2 Power Busboards to distribute power to up to 79 modules. The power is distributed through standard 16 pin eurorack power headers which are keyed to help reduce the risk of plugging in a module backwards. The header pins are clearly labeled on the Busboard for easy reference.

Structure enclosures offer industry leading power and the Structure 344 is no exception. The Structure 344 power supplies are rated at 5 amps of +12v power and 5 amps of -12v power with .5% (.06v) line regulation under full load. The +5v power rail is powered from the +12v power rail. When the +5v power rail is used, power is taken from the +12v power rail reducing the amount of +12v power available to modules. Each of the two Busboards includes a 5v regulator rated to 1.5A allowing the Structure 344 to offer a total of 3A of +5v power split evenly between the two Busboards.



14. Service and Other Information

Please contact us for service or other information related to the Structure 344 or any other Pittsburgh Modular product. www.pittsburghmodular.com/contact

15. Warranty

For a period of one year after the date of original purchase, the Structure 344 manufactured by Pittsburgh Modular Synthesizers LLC, is warranted to function properly and be free of defects in materials and workmanship. Should a factory installed hardware 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. This warranty is void if in our opinion the Structure 344 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 using a power adapter not supplied by Pittsburgh Modular Synthesizer LLC or incorrectly installing modules. In the event of such misuse/abuse by the customer, costs for repairs plus two-way shipping costs will be borne by the customer. Products 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.

