

The Voltage Research Laboratory
Encyclopedia [Touch Controller Manual](#)

Thank you!



Thank you for purchasing the Touch Controller. Your interest and investment in this unique controller helps support innovative, boutique synthesizer design. The Touch Controller is a large part of the unique vision for analog synthesis that Michael and I share.

Enjoy,
Richard Nicol
Founder | Product Design
Pittsburgh Modular Synthesizers

Voltage Research Laboratory Team

Product Design: Richard Nicol
Analog Engineering: Michael Johnsen
Logistics: Michael Importico
Fine Tuning: Perry Willig
Prototyping: Ross Johnson
Coordination: Danielle Nicol

Important Information



Read Instructions: Please read the Voltage Research Laboratory manual completely before use and retain for future reference.

- **IMPORTANT Ribbon Cable Power Information:**
The Lifeforms Touch Controller is a eurorack format synthesizer module. The module can be installed, rearranged, removed, and replaced in any compatible eurorack enclosure from Pittsburgh Modular or other manufacturers. The Lifeforms Touch Controller uses a standard 10 to 16 pin eurorack ribbon cable to connect the module to a bipolar +/-12v 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 rail and the -12v pins on the module. The Lifeforms Touch Controller includes reverse polarity protection so it will not be damaged when plugged in incorrectly; however, as a general rule, failure to match up the pins correctly can result in damage to one or all the modules in a case. On a Pittsburgh Modular enclosure power rail, the -12v pins are clearly labeled. On the Lifeforms Touch Controller module, the positive side of the pin connector is on top, and the negative sides of the pin connector is on the bottom so the red stripe should be toward the bottom of the module.
- Turn off and unplug the power from the case before removing the Eurorack power header attached to the Touch Controller module. Failing to turn off the power before removing the Eurorack power header can damage the Touch Controller module.
- The Voltage Lab is an electronic device. Exposure to water will cause the Touch Controller circuitry to short circuit and may cause permanent damage.
- Do not attempt to modify the components of the Touch Controller. Tampering with the circuitry may cause permanent damage.
- Do not place heavy objects on the Touch Controller. The user interface is mounted on a PCB that can be damaged if stressed by excessive weight.
- Do not attempt to repair the Touch Controller. Please contact Pittsburgh Modular regarding malfunctions of any kind.
- Pittsburgh Modular is not responsible for any damage or loss caused by improper use of the Touch Controller.

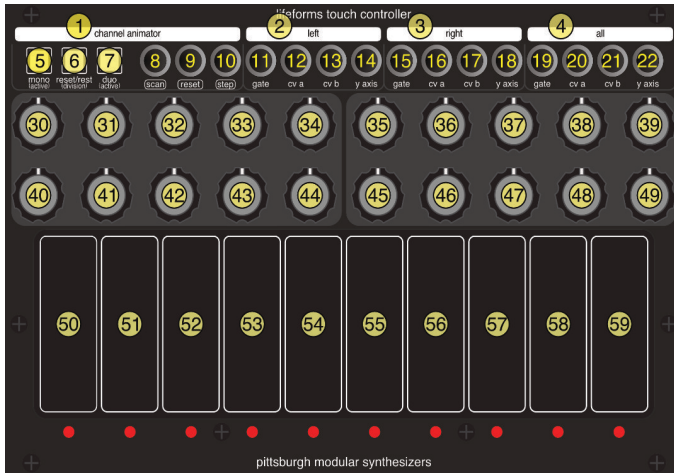
The Touch Controller Manual Revision 0



Table of Contents

Thank you!	3
Important Information	4
Table of Contents	5
User Interface Controls	6
Module Overview	7
User Interface Conventions	8
Left and Right Touch Zones	10
Controller Modes	11
Mono Mode Sequences	12
Duo Mode Sequences	14
Scan Mode	16
Eurorack Specs	17
Warranty	17
Service and Other Information	17

User Interface Controls



1. Channel Animator Section
2. Left Output Section
3. Right Output Section
4. All Output Section

5. Mono Button
6. Reset/Rest Button
7. Duo Button
8. Scan Input Jack
9. Reset Input Jack
10. Step Input Jack
11. Left Gate Output Jack
12. Left CV A Output Jack
13. Left CV B Output Jack
14. Left Y-Axis Output Jack
15. Right Gate Output Jack
16. Right CV A Output Jack
17. Right CV B Output Jack
18. Right Y-Axis Output Jack
19. All Gate Output Jack
20. All CV A Output Jack
21. All CV B Output Jack
22. All Y-Axis Output Jack

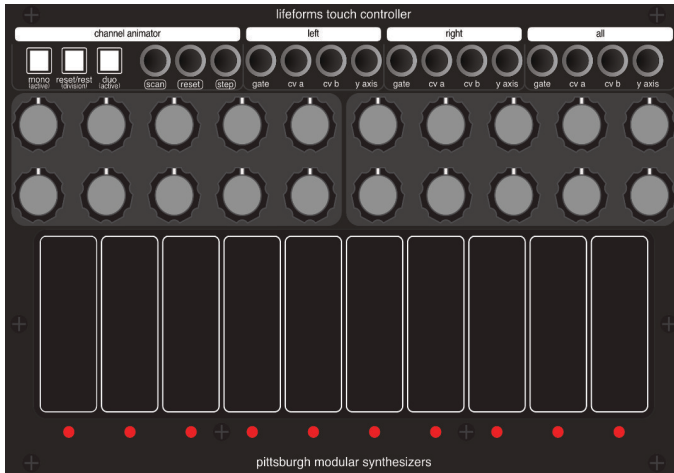
30. Channel 1 Voltage Preset Knob A
31. Channel 2 Voltage Preset Knob A
32. Channel 3 Voltage Preset Knob A
33. Channel 4 Voltage Preset Knob A

34. Channel 5 Voltage Preset Knob A
35. Channel 6 Voltage Preset Knob A
36. Channel 7 Voltage Preset Knob A
37. Channel 8 Voltage Preset Knob A
38. Channel 9 Voltage Preset Knob A
39. Channel 10 Voltage Preset Knob A

40. Channel 1 Voltage Preset Knob B
41. Channel 2 Voltage Preset Knob B
42. Channel 3 Voltage Preset Knob B
43. Channel 4 Voltage Preset Knob B
44. Channel 5 Voltage Preset Knob B
45. Channel 6 Voltage Preset Knob B
46. Channel 7 Voltage Preset Knob B
47. Channel 8 Voltage Preset Knob B
48. Channel 9 Voltage Preset Knob B
49. Channel 10 Voltage Preset Knob B

50. Touch Plate 1
51. Touch Plate 2
52. Touch Plate 3
53. Touch Plate 4
54. Touch Plate 5
55. Touch Plate 6
56. Touch Plate 7
57. Touch Plate 8
58. Touch Plate 8
59. Touch Plate 9

Module Overview

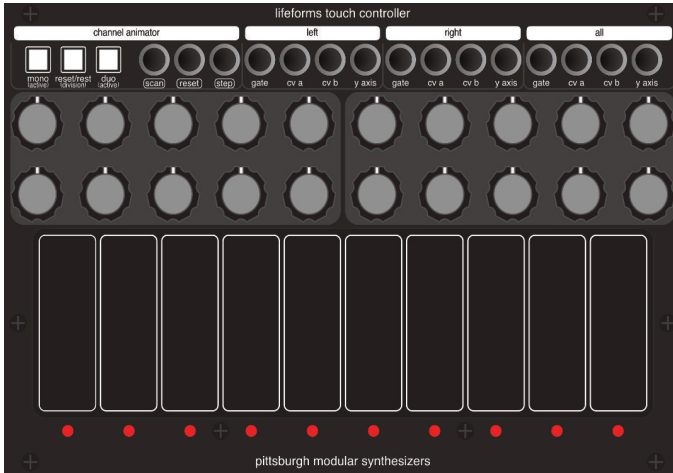


The Touch Controller is an interface for interacting with gates and voltages. The module features 10 Touch Plates, each with 2 assignable analog voltage presets, Y-Axis response, gate response, multiple performance modes, and pattern sequencing.

The interface of the Touch Controller was designed to be intuitive with direct access to all of the functions. The knobs on the Touch Controller set the analog voltage preset values for the touch plates while the 3 buttons in the Channel Animator section manage performance modes and sequencer settings.

Using the Touch Controller requires a basic understanding of both the user interface and Controller Modes. The touch surface is split into 2 Touch Zones, Left and Right. Each Touch Zone has 5 Touch Plates and a dedicated output section. The Left Output Section always responds to the Left Touch Zone and the Right Output Section always responds to the Right Touch Zone. The response of the All Output Section is determined by the active Controller Mode.

User Interface Information



There are some user interface and general patching conventions that need to be understood to achieve the best results from the Touch Controller.

Touch Plates

The Touch Controller has 10 Touch Plates. The Touch Plate checks for on/off status and reads the finger position along the Y-Axis. The position is translated into a 0 to 5 volt CV signal. The unique design of the Touch Plate attempts to minimize the impact of finger surface area when determining the location but capacitive touch responds strongly to increased surface area. Pressing firmly, using more of the finger, or using multiple fingers when touching the Touch Plates will have an effect on the output voltage.

The 10 Touch Plates of the Touch Controller utilize capacitive touch technology to create an interactive touch surface. Capacitive touch is far from perfect in the best of conditions. We have tuned our circuitry and software to mitigate the side effects of capacitive touch but anomalies exist. The process of measuring small amounts of change in capacitance to register a touch and determine y-axis location and is sensitive to many outside variables. Different power sources can create a different capacitive touch sensitivity response. The variation can be caused by both the +12v power supplied by the eurorack case, the power mains, and most importantly, the quality of the earth ground the case is plugged into. Also, because capacitive touch integrates the human body into the circuit, response can vary from person to person. Poor grounding, some fluorescent lighting fixtures, and some power strips can cause problems with the response of the Touch Controller.

User Interface Information Section (2 of 2)

Patch Points

The Touch Controller uses Eurorack standard 1/8" mono jacks for all the patch points. Input jacks have an outline around their name. Output jacks do not. The Touch Controller interface does not distinguish between audio, CV, and gate signals. In theory, any output can be patched into any input. In practice, inputs respond best when patched to the expected signal type. However, experimentation can yield surprising results. The type of signal input and output of each jack is covered in the corresponding section.

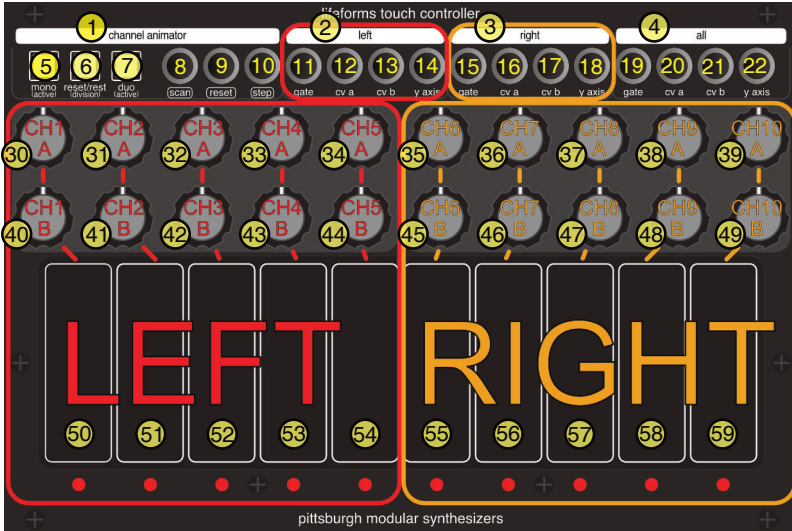
Voltage Preset Knobs

The two rows of Voltage Preset Knobs set the CV A and CV B analog, unquantized output voltages for the corresponding Touch Plate. The top row sets CV A and the bottom row sets CV B. The knobs are calibrated to output between 0 volts and 5 volts. The maximum output voltage can be modified using the calibration trim pots on the rear of the unit between anywhere between 0 volts and 9 volts.

Button Functionality

All the buttons have 2 functions. A main function clearly labeled below and a sub-function printed in parentheses. To access the sub-function, press and hold down the button before pressing a Touch Plate. The main function and sub-function of each button is covered in the Channel Animator section.

Left & Right Touch Zones



Left & Right Touch Zones

The Touch Controller is split into 2 Touch Zones, Left and Right, each with 5 Touch Plates. The Touch Zones allow the Touch Controller to always function as a pair of standalone touch interfaces. Each Touch Zone has a dedicated set of outputs. GATE OUTPUT JACK(11,15), CV A OUTPUT JACK(12,16), CV B OUTPUT JACK(13,17), Y-AXIS OUTPUT JACK(14,18). The Left and Right zone outputs are always active in both Mono and Duo modes.

The GATE OUTPUT JACK(11,15) outputs a 6 volt, 13ms gate signal when a Touch Plate is pressed, a sequence is advanced within the zone, or a change in the scan value is detected.

CV A OUTPUT JACK(12,16) outputs a voltage determined by the VOLTAGE PRESET KNOB A of the active Touch Plate. The output range of the LEFT and RIGHT CV A OUTPUT JACK (12,16) is 0 to 5 volts.

CV B OUTPUT JACK(13,17) outputs a voltage determined by the VOLTAGE PRESET KNOB B of the active Touch Plate. The output range of the LEFT and RIGHT CV B OUTPUT JACK (13,17) is 0 to 5 volts.

Y-AXIS OUTPUT JACK(14,18) outputs a voltage determined by the Y-axis touch location of the active Touch Plate. The output range of the Y-AXIS OUTPUT JACK(14,18) is 0 to 5 volts.

Controller Modes

Mono and Duo Controller Modes

The Touch Controller operates in 2 different modes. Mono and Duo. Select the active mode by pressing the MONO BUTTON (5) or DUO BUTTON (7) in the CHANNEL ANIMATOR SECTION (1).

Mono Mode

In Mono mode, the Touch Controllers operates like a single, monophonic 10 Touch Plate controller. The ALL OUTPUT SECTION (4) combines the Left and Right Touch Zones into one section. The ALL GATE OUTPUT (19) represents the state of the active Left or Right Touch Plate. The ALL Y-AXIS OUTPUT (22) represents the Y-Axis value of the last Left or Right Touch Plate used. The ALL CV A OUTPUT (20) outputs the VOLTAGE PRESET KNOB A value of the active Left or Right Touch Plate. The ALL CV B OUTPUT (21) outputs the VOLTAGE PRESET KNOB B value of the active Left or Right Touch Plate.

The ALL GATE OUTPUT JACK(19) outputs a 6 volt, 13ms gate signal when a Touch Plate is pressed, a sequence is advanced, or a change in the scan value is detected.

ALL CV A OUTPUT JACK(20) outputs a voltage determined by the VOLTAGE PRESET KNOB A of the active Touch Plate. The output range of the ALL CV A OUTPUT JACK (20) in Mono Mode is 0 to 5 volts.

ALL CV B OUTPUT JACK(21) outputs a voltage determined by the VOLTAGE PRESET KNOB B of the active Touch Plate. The output range of the ALL CV B OUTPUT JACK (21) in Mono Mode is 0 to 5 volts.

Y-AXIS OUTPUT JACK(22) outputs a voltage determined by the Y-axis touch location of the active Touch Plate. The output range of the ALL Y-AXIS OUTPUT JACK(22) is 0 to 5 volts.

Duo Mode

In Duo mode, the response of the ALL OUTPUT SECTION (4) is more complex. Like Mono mode, the ALL GATE OUTPUT (19) represents the state of the last touched Left or Right Touch Plate and the ALL Y-AXIS OUTPUT (22) represents the Y-Axis value of the last Left or Right Touch Plate used. However, in Duo mode, the ALL CV A OUTPUT (20) outputs a SUM of the active Left VOLTAGE PRESET KNOB A and the active Right VOLTAGE PRESET KNOB A. The ALL CV B OUTPUT (21) outputs a SUM of the active Left VOLTAGE PRESET KNOB B and active Right VOLTAGE PRESET KNOB B. Summing the Left and Right VOLTAGE PRESET KNOBs creates interesting potential for transposition and larger CV output voltages.

The ALL GATE OUTPUT JACK(19) outputs a 6 volt, 13ms gate signal when a Touch Plate is pressed, a sequence is advanced, or a change in the scan value is detected.

ALL CV A OUTPUT JACK(20) outputs a voltage determined by the sum of the LEFT and RIGHT VOLTAGE PRESET KNOB A for the active Touch Plates. The output range of the ALL CV A OUTPUT JACK (20) in Duo Mode is 0 to 10 volts.

ALL CV B OUTPUT JACK(21) outputs a voltage determined by the sum of the LEFT and RIGHT VOLTAGE PRESET KNOB B for the active Touch Plates. The output range of the ALL CV B OUTPUT JACK (21) in Duo Mode is 0 to 10 volts.

Y-AXIS OUTPUT JACK(22) outputs a voltage determined by the Y-axis touch location of the active Touch Plate. The output range of the ALL Y-AXIS OUTPUT JACK(22) is 0 to 5 volts.

Mono Mode Sequencing



Mono Mode Sequencing

The Touch Controller can quickly create sequences using the Channel Animator section. A Mono sequence utilizes the Left, Right, and All Output Jacks. The ALL OUTPUT SECTION is updated with every active step. If the active step is in the Left Zone, the LEFT OUTPUT SECTION is updated, if the active step is in the Right Zone, the RIGHT OUTPUT SECTION is updated.

Clocking a Sequence

The sequence is clocked using the STEP INPUT JACK (10). Sending a trigger or gate into the STEP INPUT JACK (10) will advance the sequence 1 step.

Mono Sequence Clock Divider

A clock divider can be used to divide the incoming clock signal. The clock divider can be set to $\div 1$, $\div 2$, $\div 3$, $\div 4$, $\div 5$, $\div 6$, $\div 7$, $\div 8$, $\div 9$, or $\div 10$. Set the clock division by pressing and holding the RESET/REST BUTTON then pressing the corresponding TOUCH PLATE.

The selected clock division is not saved when the Touch Controller is powered off. The default clock division is $\div 1$.

Resetting a Sequence

The sequence can be reset to step 1 a few different ways. Pressing the RESET/REST BUTTON (6) resets the sequence to step 1. Sending a trigger or gate signal into the RESET INPUT JACK (9) also resets the sequence to step 1.

Mono Mode Sequencing Section (2 of 2)

Programming a Sequence

In Mono Mode, the Sequencer treats all 10 Touch Plates as a single monophonic touch interface. A sequence is recorded by pressing and holding the MONO BUTTON (5). While the MONO BUTTON (5) remains pressed, up to 64 steps can be added to the sequence by tapping the Touch Plates. The Y-Axis is also recorded into the sequence during programming.

While the MONO BUTTON (5) remains pressed, a Touch Plate can be pressed multiple times to repeat a step.

While the MONO BUTTON (5) remains pressed, the RESET/REST BUTTON (6) can be pressed to add a rest step in the sequence.

The sequence begins cycling through the programmed steps as soon as the first step is programmed and a trigger or gate signal triggers the STEP INPUT JACK (10). To prevent the sequence from cycling during programming, remove the clock from the STEP INPUT JACK (10) until programming is finished.

Clearing a Sequence

Press and release the MONO BUTTON (5) without touching a TOUCH PLATE to clear the sequence.

Switching from Mono to Duo clears the sequence.

Powering off the Touch Controller will clear the sequence.

Attention!

While a sequence is running, touching the TOUCH PLATES will not trigger the channel. Instead, touching a TOUCH PLATE will re-record the Y-Axis. This allows the Y-Axis recorded into the sequence to be modified without changing the selected channel sequence.

If the Touch Plates are not responding to touch, Press and release the MONO BUTTON (5) to clear the active sequence and enable the Touch Plates.

Duo Mode Sequencing



Duo Mode Sequencing

The Touch Controller can quickly create 1 or 2 simultaneous sequences using the Channel Animator section. The Left and Right Zones can be used to create 2 independent sequences. If the Left Zone sequence is active, the LEFT OUTPUT SECTION is updated, if the Right Zone sequence is active, the RIGHT OUTPUT SECTION is updated.

The ALL GATE OUTPUT (19) is triggered by an active step in the Left Zone or and active step in the Right Zone. The ALL Y-AXIS OUTPUT (22) represents the Y-Axis value of the last Left or Right active sequence step. The ALL CV A OUTPUT (20) outputs a SUM of the active Left VOLTAGE PRESET KNOB A and the active Right VOLTAGE PRESET KNOB A. The ALL CV B OUTPUT (21) outputs a SUM of the active Left VOLTAGE PRESET KNOB B and active Right VOLTAGE PRESET KNOB B. Summing the Left and Right VOLTAGE PRESET KNOBS creates interesting potential for transposition and larger CV output voltages.

Clocking a Sequence

The sequences are clocked using the STEP INPUT JACK (10). Sending a trigger or gate into the STEP INPUT JACK (10) will advance the sequences 1 step.

Duo Sequence Clock Divider

A clock divider can be used to divide the incoming clock signal. The Left Zone Sequence and the Right Zone Sequence can be divided independently. The clock divider for each zone can be set to $\div 1$, $\div 2$, $\div 3$, $\div 4$, or $\div 8$. Set the clock division by pressing and holding the RESET/REST BUTTON then pressing the corresponding TOUCH PLATE in the Left or Right Zone.

The selected clock divisions are not saved when the Touch Controller is powered off. The default clock division is $\div 1$.

Duo Mode Sequencing Section (2 of 2)

Resetting Both Sequences

The sequences can be reset to step 1 a few different ways. Pressing the RESET/REST BUTTON (6) resets both sequences to step 1. Sending a trigger or gate signal into the RESET INPUT JACK (9) also resets both sequences to step 1. The sequences can not be reset independently.

Programming the Sequences

In Duo Mode, the Left Zone and Right Zone work as independent sequencers. A sequence is recorded by pressing and holding the DUO BUTTON (7). While the DUO BUTTON (7) remains pressed, up to 64 steps can be added to the Left and Right sequences by tapping the Touch Plates. The Y-Axis is also recorded into the sequence during programming.

The Left and Right Sequences can be entered simultaneously or one at a time.

While the DUO BUTTON (7) remains pressed, a Touch Plate can be pressed multiple times to repeat a step.

While the DUO BUTTON (7) remains pressed, the RESET/REST BUTTON (6) can be pressed to add a rest step in the sequence with the last assigned step. If no steps have been programmed in the Left or Right sequencers, the rest is assigned to the first step of the Left sequencer.

The sequencers begin cycling independently through their programmed steps as soon as the first step of a sequence is programmed and a trigger or gate signal triggers the STEP INPUT JACK (10). To prevent the sequencers from cycling during programming, remove the clock from the STEP INPUT JACK (10) until programming is finished.

If only one sequence is active, the other Touch Plate Zone can be played manually.

Clearing a Sequence

Press and release the DUO BUTTON (7) without touching a Left or Right Touch Plate to clear the sequences.

Switching from Duo to Mono clears the sequences.

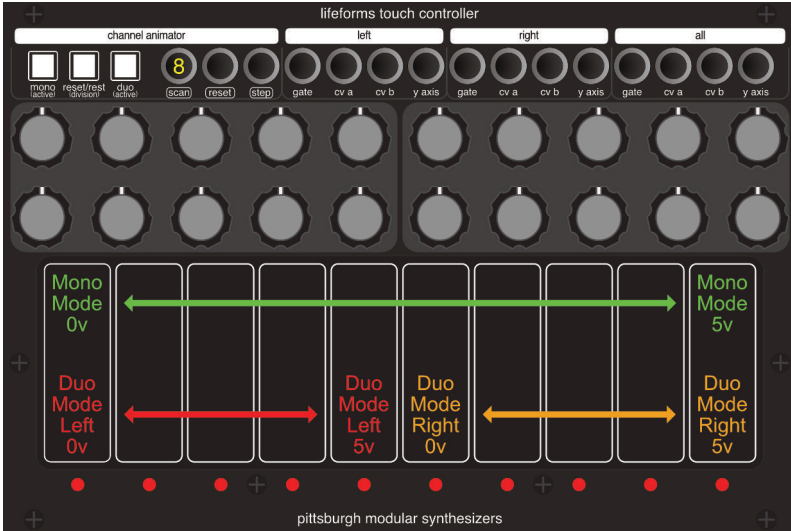
Powering off the Touch Controller will clear the sequences.

Attention!

While the Left and/or Right sequencers are running, touching their Touch Plates will not trigger the channel. Instead, touching a TOUCH PLATE will re-record the Left or Right Y-Axis. This allows the Y-Axis recorded into the sequence to be modified without changing the selected channel sequence.

If the Touch Plates are not responding to touch, Press and release the DUO BUTTON (7) to clear the active sequences and enable the Left and Right Touch Plates.

Scan Mode



Scan Mode Active Channel Sequencing

The SCAN INPUT JACK (8) of the Touch Controller accepts a 0v to 5v control voltage signal and sets the active channel based on the incoming voltage. The Scan Input updates the active channel when the incoming voltage changes.

In Mono Mode, the Scan input spreads the 0 to 5v range across all 10 channels. In Duo Mode the Scan input spreads the 0v to 5v range across both the Left and Right sides so each side responds the the full 0v to 5v range.

More Information

Eurorack Specs

Panel size: 38hp.

Module depth: 35mm.

Power consumption: +12v 165mA, -12v 95mA. Does not require +5v. Reversed power polarity protection. Due to the complexity of this module, it requires a significant amount of power. Please use a clean, high quality power source for optimum performance.

Warranty

For a period of one year after the date of original purchase, the Lifeforms Touch Controller 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 Lifeforms Touch Controller 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. 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.

Service and Contact Information

Please contact us for service or other information related to the Lifeforms Touch Controller or any other Pittsburgh Modular product.

www.pittsburghmodular.com/contact



Pittsburgh Modular Synthesizers