ARCHAEA

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WARNING - READ THIS FIRST!

Before you plug this module into your rack and start to use it:

1. Disconnect your rack from the mains supply.
2. **MAKE SURE THE POWER CABLE CONNECTORS ARE INSERTED THE CORRECT WAY ROUND!** The red stripe on the Eurorack power cable must be orientated as indicated on your rack power supply bus. This module has a shrouded header to prevent mis-orientation of the supplied cable. If the power cable is changed from the supplied cable, an incorrectly assembled cable could still cause issues. If the stripe on a different cable does not match the stripe on the module when plugged in, do not power up, and use a different cable!
3. Double check the power cable orientation before switching the rack power on!

IF PLANNING TO USE THE EURORACK POWER BUS CV/GATE FOR AN EXCHANGE DATA BUS, ENSURE NO OTHER MODULE TYPES ARE USING THESE CONNECTIONS! Otherwise this could result in damage to your modules, see the Data Bus Connections section.

Your rack MUST have sufficient spare power available to power the module, otherwise unexpected behaviour will occur. The maximum current requirements of the module for each voltage are given in the Specifications section. The current draw of each module, for each voltage, must add up to less than the total current capability of your rack power supply.

The maximum voltage range which can be present at the input or output jack sockets is -12..12V. The warranty does not cover damage to the module from incorrectly powering the module or exceeding the jack voltage range.

Credits

Designed in Bristol, UK by Archaea. Many thanks to Don Tyler (Remote Vision, Synphaera) and Rich Hallett for beta testing and feature suggestions.

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First of all, thank you for purchasing this module from Archaea! We hope this is a useful tool for helping you simplify your patching workflow in your modular synthesizer rig and opening up real-time creative patching possibilities.

Overview

Exchange is a patching module where the 8 inputs can be switched to any of the 8 outputs. By connecting other modules to Exchange, patches can be created using the 8 input and output buttons, and stored as presets for instant re-patching. Beyond this, Exchange has features for changing patches by MIDI, CV or triggers, sequencing patches, and creating patching chains and synchronising multiple Exchange modules for more complex set ups.

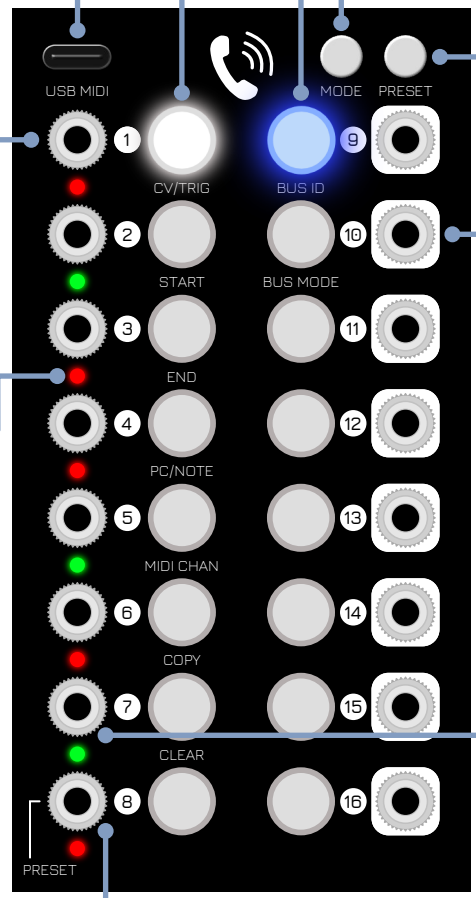
Getting Started - Main Page

To make a patch using Exchange, the outputs of other modules or signal sources are first connected to the input jacks, and the output jacks are connected to the inputs of other modules. Exchange acts like a 'patching matrix' between its inputs and outputs. To connect an input to an output, first press an input button to select an input to connect (see diagram to the right, **Front Panel Overview & Main Page**). Next press an output button and the input is connected to the output. Multiple outputs can be connected by pressing further output buttons. Buttons will glow when a their corresponding inputs and outputs are connected. Pressing an output again toggles the connection.

Note: inputs can connect to up to 8 outputs, but outputs can connect to ONLY one input. This is because inputs can be split but outputs can not be combined or mixed, just like regular cable patching. The outputs in Exchange are buffered, so input splitting will not degrade the signal, in the same way as in a fixed 'buffered multiple' module.

The architecture is shown in the Blocks and Connections section. Exchange has 8 main 'multiplexors' (on the right) with 8 inputs each. A multiplexor is a switch that can connect one of its inputs to its outputs. The main multiplexors connect one of the 8 analog inputs to each of the analog outputs. Additionally, there are 'chain' inputs and outputs (see section Chaining), and 8 chain input multiplexors (on the left) for selecting the chain or jack inputs.

Front Panel Overview & Main Page



Input Buttons (1-8)
A tap selects an input. Glows white when selected. A second tap will toggle the input source mode.

Output Buttons (9-16)
A tap toggles the connection between the output and the currently selected input. Glows blue when connected.

USB Port
This port allows Exchange to be connected to a USB MIDI host. MIDI signals can be used to control preset selection.

Mode Page Button
A tap enters the mode page. This glows red when selected.

Input Jacks (1-8)
The outputs from other modules or signal sources are connected to the input jacks.

Preset Page Button
A tap enters the preset page. This glows red when selected.

Output Jacks (9-16)
The output jacks are connected to the inputs of other modules or signal receivers.

Input Source Indicator
The LEDs below each input jack indicate the source for the input: red - chain input, green - jack input. The source selected depends on the input mode. When in the detect mode, inserting a jack will switch from the chain to jack input. When in the chain mode, the chain input is always selected.

Reset Input Jack
Input jack 7 can be configured to reset to the start preset using a trigger signal. Ordinarily, it behaves like the other inputs.

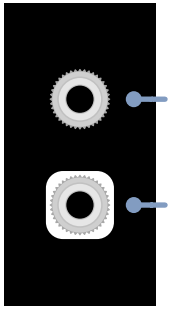
Preset Input Jack
Input jack 8 can be configured to select a preset either using a trigger signal or CV. Ordinarily, it behaves like the other inputs.

IMPORTANT! When connecting a jack cable to an input, check that the input source indicator LED has turned green. If it remains red with a jack inserted then the input is in chain mode. Tap the input button once to switch to input detect mode which will then turn the LED green. The jack input will now be ready to patch to the outputs. For details see section Chaining.

Connection Properties

The patch connections are all standard Eurorack 3.5mm mono jack sockets. Exchange can switch input signals up to -10..10V. Signals up to a maximum of -12..12V can be safely applied, but clipping starts to occur beyond ±10V.

The front panel is labelled to denote which jacks are inputs and which jacks are outputs as shown here. No harm will be caused if inputs are accidentally connected together or if outputs are connected together. However doing this will have no effect.



Input Jack
A plain jack denotes an input jack.

Output Jack
A jack with a box surround denotes an output jack.

Rear Panel Connections

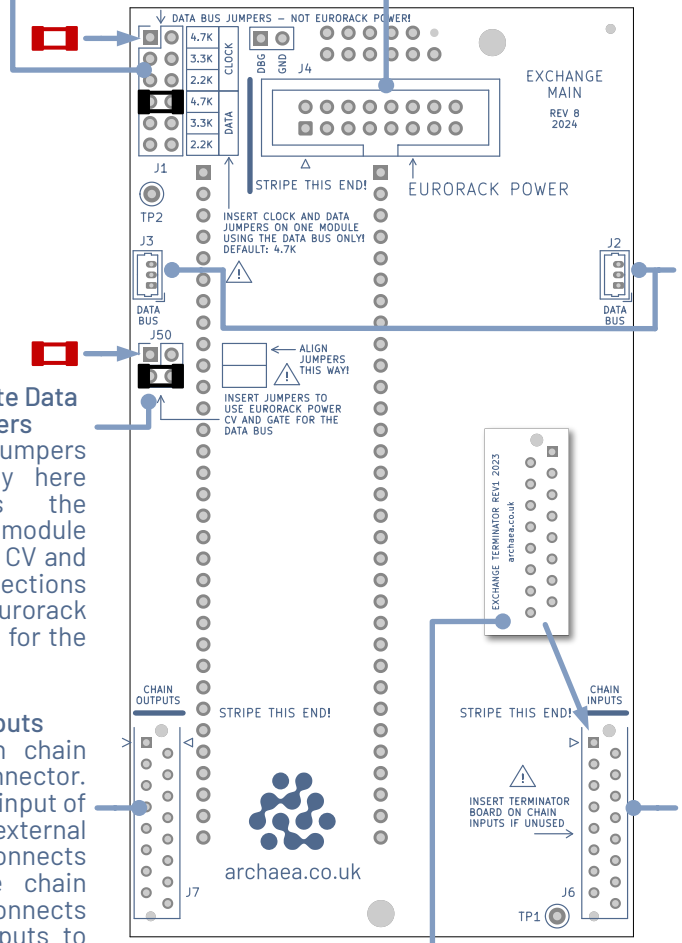
The rear panel is shown in the diagram to the right, **Rear Panel**. The power is connected through a 16-way Eurorack power header. It is essential to ensure that the power cable used has the stripe aligned with the connector end shown. There are also two patch chain connectors and two data bus connectors.

The patch chain connectors provide a way of connecting all the outputs of one Exchange to the inputs of another, forming a patch chain without needing to use jack cables. The data bus connectors allow Exchange modules to share their settings, such as a preset change or which inputs and outputs in a patch chain are currently connected. For details see section Chaining.

Note: Exchange ships with the rear panel connections and jumpers set up for single module, i.e. non-chained, operation. The single module operation set up is: 1) the data bus jumpers both across the 4.7K pins, 2) the chain terminator board attached to the chain inputs, and 3) the CV and Gate Data Bus jumpers unconnected. Use this configuration for single module operation. The chain terminator board ensures the chain inputs feed in 0V when selected.

Rear Panel

Data Bus Jumpers
The data bus jumpers are used to configure the bus electrically. For the bus to work correctly, one and ONLY ONE module on the bus must have at least one jumper on both the clock and data pins. It is usually sufficient to put a jumper horizontally across the 4.7K clock and 4.7K data pins.



Eurorack Power
Power is provided here through a 16-way Eurorack Power header. The stripe on the cable MUST go at the end where indicated.

Data Bus
The two data bus connectors are provided in order to allow modules to communicate settings without using the CV and gate connections of the Eurorack power bus. Two connectors are provided to allow the data bus to be easily chained together.

CV and Gate Data Bus Jumpers
Inserting jumpers horizontally here configures the Exchange module to use the CV and gate connections of the Eurorack power bus for the data bus.

Chain Outputs
The patch chain output connector. The chain input of an external module connects here. The chain output connects the 8 outputs to the 8 signals in the cable.

Chain Inputs
The patch chain input connector. The chain output of an external module connects here. The chain input connects 8 signals from the cable to the 8 inputs.

Chain Terminator
Connect the terminator board here when the chain inputs are not connected.

The user interface of Exchange is organised into a number of 'pages'. Exchange starts with the main page at power up, which is used to make live patch connections and show which outputs are connected to the inputs through the main button LEDs. The other pages are entered by pressing the MODE and PRESET buttons. These pages use the main buttons and their LEDs to show the settings of Exchange and to allow them to be altered.

Preset Page

The patch settings can be saved to presets for recall later through the PRESET page. To enter the preset page, tap the PRESET button. It will glow red when in the preset page. Pressing the preset button again exits back to the main page. There are 64 presets which are organised into 8 banks containing 8 presets. The banks are selected by pressing buttons 1-8 and the presets of each bank by pressing buttons 9-16. The previously selected preset is indicated by the corresponding bank and preset buttons flashing.

To Load a Preset

1. Tap the bank button 1-8 to select the bank (if a different bank to the previous is required).
2. Tap the preset button 9-16 to select the preset in that bank. The preset button will flash green once to indicate the preset has been loaded to the current patch settings. Exchange will exit to the main page.

To Save a Preset

1. Tap the bank button 1-8 to select the bank (if a different bank to the previous is required).
2. Hold the preset button 9-16 for 1 second to select the preset to save the current patch settings to. The preset button will flash green once and Exchange will exit to the main page.

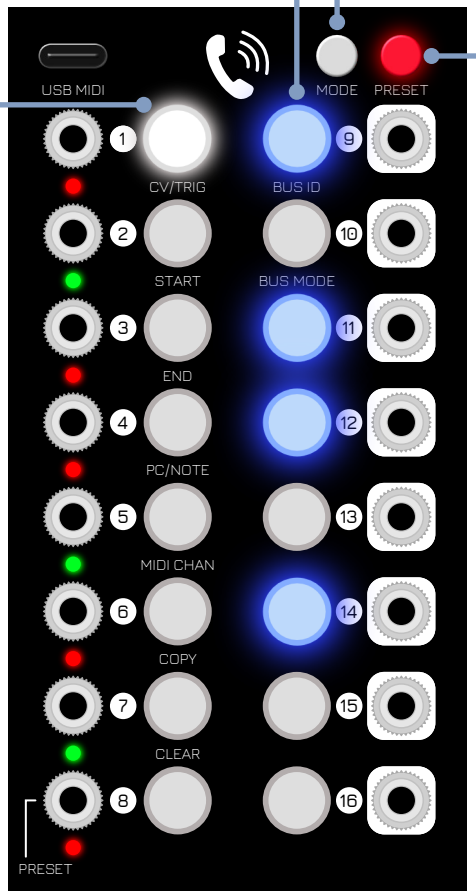
Note: Exchange retains presets and the current patch connections after power off. Changes are written after 2 seconds of inactivity to prevent excessive wear to the non-volatile memory. Always wait 2 seconds after button presses before power off to prevent data loss.

Preset Page

Preset Buttons (9-16)
A tap loads one of the 8 presets from bank. The current preset flashes blue. All presets that have connections glow blue. A tap on a preset button loads a preset into the current settings. Holding down the preset button for more than a second saves the current settings to the preset. Loading or saving a preset returns to the main page.

Mode Button
A tap enters the mode page.

Bank Buttons (1-8)
A tap selects one of the 8 preset banks. The current selected bank flashes white.



Preset Button
Glows red when in the preset page. A tap exits the preset page and returns to the main page. Flashes green once to show a preset has been loaded or saved.

Mode Page

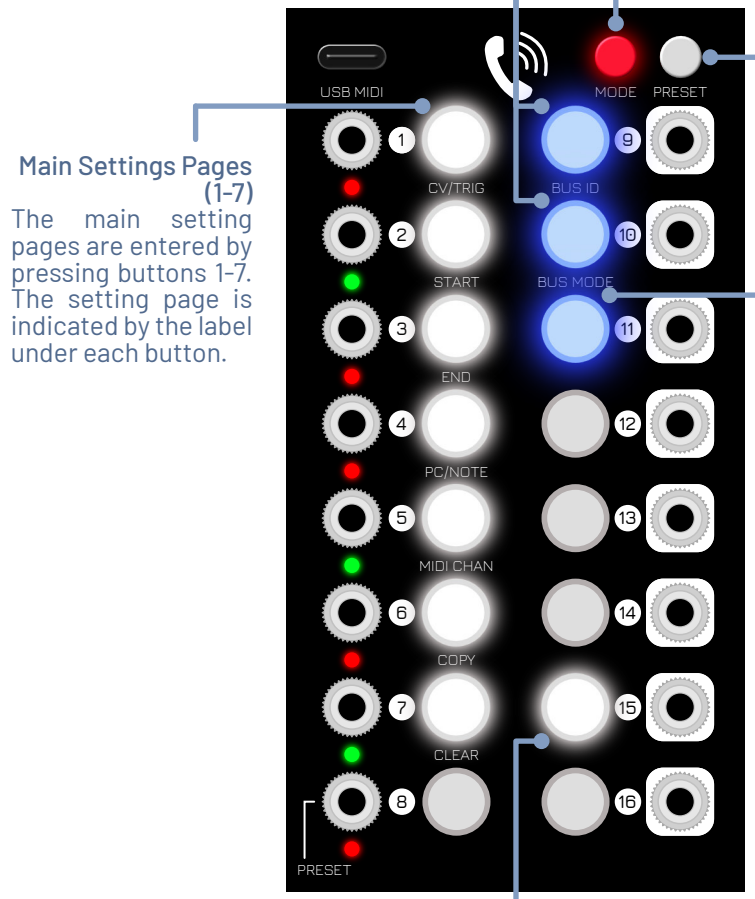
The MODE page is a top-level page for all of the mode settings pages. The corresponding settings pages are indicated on the front panel by the labels under buttons 1-7, 9 and 10. The pages are entered by pressing one of these buttons, which additionally glow in the mode page to show which buttons are assigned to a settings page, as shown on the right in figure **Mode Page**. The functions and settings available in each page are in the following table.

Button	Page	Overview	Type
1	CV/TRIG	Preset change input settings.	Options.
2	START	Start preset of the preset change set.	Value, 1-64.
3	END	End preset of the preset change set.	Value, 1-64.
4	PC/NOTE	MIDI program change and note settings.	Options.
5	MIDI CHAN	MIDI channel.	Value, 1-16.
6	COPY	Copy preset function.	Value, 1-64 x2: copy from, to.
7	CLEAR	Clear preset function.	Value, 1-64.
9	BUS ID	Bus ID number.	Value, 1-64.
10	BUS MODE	Bus mode settings.	Options.
11	MIDI UTIL	MIDI utilities.	Options.

CV/TRIG, PC/NOTE and BUS MODE are options pages, in which features are selected and enabled. START, END, MIDI CHAN, COPY, CLEAR and BUS ID are value pages, in which the main buttons 1-16 are used to input a value. Each page is described in the following sections.

Note: the module can additionally be reset to the factory presets from the MODE page, see the figure to the right.

Mode Page



CV/TRIG Page

The CV/TRIG page provides the settings for the preset change input. The preset change input switches presets in response to two types of signal, 1) a 5V trigger/pulse signal, and 2) a 0-5V control voltage. The preset change input can be used to change presets up to 50 times per second. There are 4 preset change modes, which are described below.

Preset Input Control Voltage Mode

The control voltage (CV) mode will select a preset from a contiguous set of presets defined between START and END (see the following sections). The voltage bands that selects a preset is derived from 5V divided between the number of presets in the set.

Preset Trigger Sequence Mode

The trigger modes will change preset within the set of presets with each rising edge of a trigger signal at the PRESET input port (input 8). The sequence mode starts at START, steps up with each trigger and repeats on reaching END. If END is a lower preset number than START, then a trigger input will cause the preset to be stepped down through the preset set. The sequence can be reset to START by a trigger signal at the RESET input port (input 7), or manually, see section Main Page - Sequence Reset Functions.

Note: the presets are numbered 1-8 for presets in bank 1, then 9-16 for bank 2, up to 57-64 for bank 8.

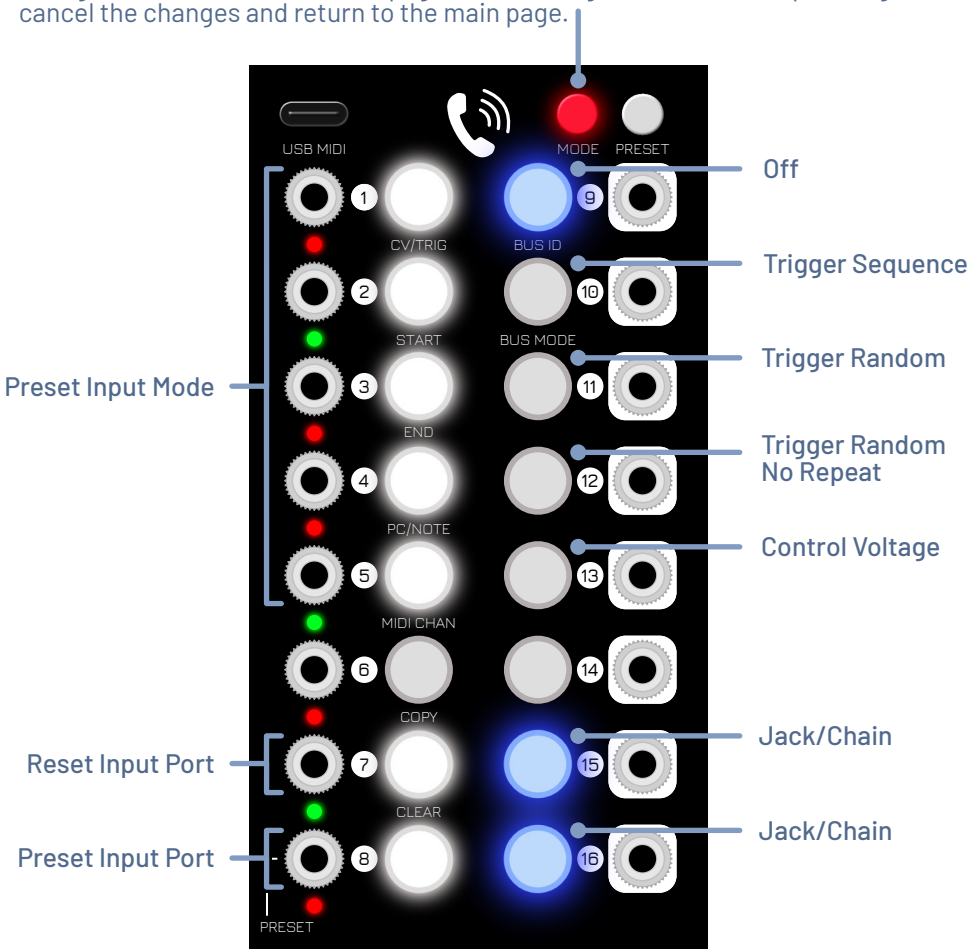
Preset Trigger Random Mode

In this mode, a preset is selected at random on each trigger. The sequence is ‘pseudorandom’ and it is possible for the same preset to be selected more than once in sequence. A RESET trigger will switch to the initial preset of the random sequence.

Preset Trigger Random No Repeat Mode

This mode is the same as the Random Mode, except the same preset will not be selected more than once in the random sequence.

CV/TRIG Page



Preset and Reset Input Ports

The preset and reset input ports can be switched between input jacks on the front panel or their chain inputs. When a chain input is used, the input jack is then available as a patching input. The chain input can be used by connecting Exchange to an Expander module or another Exchange module. The port is indicated by the righthand button, where glowing blue indicates 'jack' and not glowing 'chain'. Pressing the righthand button will toggle the jack/chain mode.

Note: In the CV/TRIG page, and all other options pages, the options are indicated and selected using the main buttons. The lefthand buttons indicate the positions of option sets by glowing white. The selection is made by pressing the righthand buttons at the same rows. A selection is indicated by the righthand buttons glowing blue.

In all MODE pages, after selecting the desired settings, the MODE button must be pressed when glowing green to confirm the changes and return to the main page.

START Page

The START page sets the start preset in the preset change set. The preset is selected in a similar way to the PRESET page, the bank is selected on buttons 1-8 and the preset within the bank with buttons 9-16. Unlike the PRESET page, once the bank and preset have been selected, MODE will glow green and MODE must be pressed to confirm the selection. Pressing MODE before selecting a preset within a bank will cancel the selection and return to the main page.

END Page

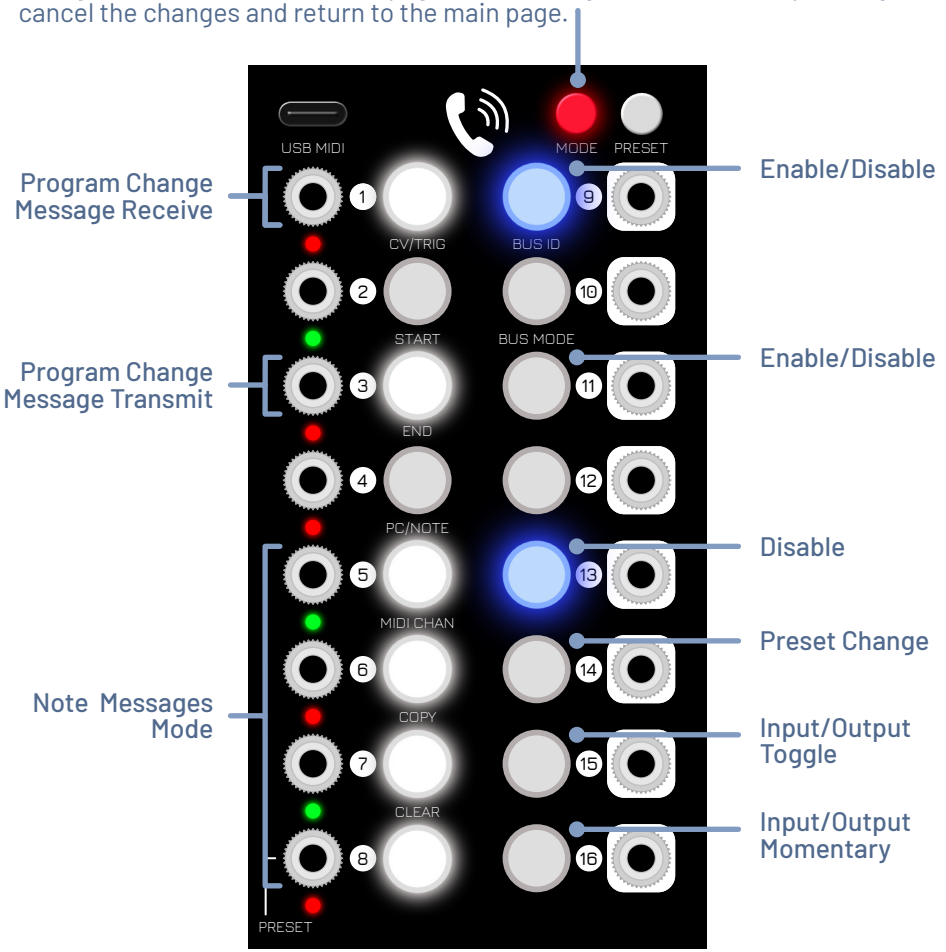
The END page sets the end preset in the preset change set. This is selected in the same way as the start page.

PC/NOTE Page

The PC/NOTE page sets which MIDI messages Exchange will receive or transmit, including program change and note messages.

PC/Note Page

Mode Button
Glows green when settings have been changed. Press when green to confirm the changes and return to the main page. Otherwise glows red, where pressing will cancel the changes and return to the main page.



The program change (PC) message receive mode enables Exchange to load a preset in response to a MIDI PC message received from the USB MIDI port. Program change messages 0-63 correspond to presets 1-64. The enable state is indicated by the righthand button, where glowing blue indicates enabled and not glowing disabled.

Pressing the righthand button will toggle the enabled/disabled state. Similarly, the program change message transmit mode enables Exchange to send a MIDI PC message to the USB MIDI port when a preset load is initiated. This can be from a manual preset load, a preset input event or a MIDI bus preset load.

The note messages mode determines how Exchange will respond to MIDI note messages. One of four options can be selected as described below.

Option	Function
Disable	MIDI note mesages are ignored.
Preset Change	MIDI note on messages between C0 (24) - D#5 (87) will trigger a preset load corresponding to presets 1-64.
Input/Output Toggle	MIDI note on messages will toggle on/off the connections between the 8 outputs and each input, where the first 8 notes of each octave from C0 (24) - G0 (31) to C7 (108) - G7 (115) correspond to each of the outputs for each input. E.g. C0 - G0 corresponds to outputs 1-8 connected to input 1, C1 - G1 corresponds to outputs 1-8 connected to input 2, and so on. Notes C-1 (12) to G-1 (19) will toggle the input mode, i.e. input detect or chain, of inputs 1-8.
Input/Output Momentary	As for the mode above, but a note on message will connect the output to the input, and a note off message will disconnect them. Similarly, note on will set the input mode to detect and note off will set the input mode to chain.

Note: MIDI note messages can be received either via the USB MIDI port or the MIDI BUS, when MIDI USB to MIDI bus thru is enabled, see the MIDI utilities page.

MIDI CHAN Page

The MIDI CHAN page sets the MIDI channel. This channel number is used for receiving MIDI messages on the USB MIDI port. The MIDI channel number is selected by pressing the corresponding button 1-16. The MODE button glows green once a selection is made. This is confirmed by pressing the MODE button which returns to the main page.

COPY Page

The COPY page copies the settings of one preset to another. The preset selection is made in the same way as the start page, with the preset to copy from selected first, and the preset to copy to selected second. The from and to selections must be confirmed by pressing MODE when it glows green.

CLEAR Page

The CLEAR page clears a selected preset by removing all connections. The preset to clear is selected in the same way as the START page.

BUS ID Page

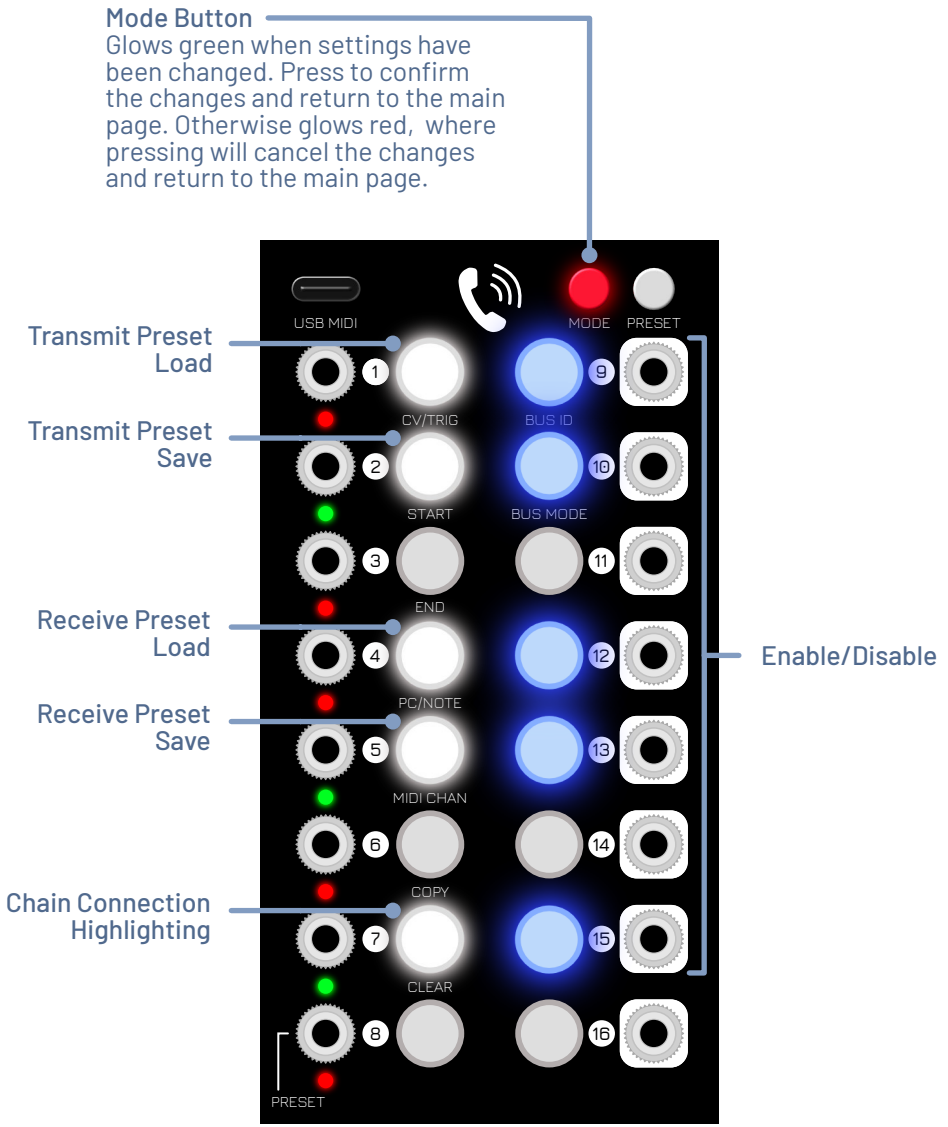
The BUS ID page sets the bus ID number to assign to the Exchange module. The value is selected in the same way as the start page, with the values 1-64 assigned in the same way as presets between the left and right main button columns. See the Chaining section for more details about using the bus ID number in a chain of Exchange modules.

BUS MODE Page

The BUS MODE page sets the types of messages that are transmitted or received on the data bus. There are 5 message receive or transmit settings that can either be enabled or disabled as shown in the Bus Mode Page figure. The enable/disable settings work in the same way as the PC/NOTE page. An overview of the settings is given below with more details given in the Chaining section.

Setting	Overview
Transmit Preset Load	On a preset load, transmit a message to all other modules on the bus to load a preset with the same number (1-64).
Transmit Preset Save	On a preset save, transmit a message to all other modules on the bus to save a preset with the same number (1-64).
Receive Preset Load	On receiving a message to load a preset, load the specified preset number (1-64).
Receive Preset Save	On receiving a message to save a preset, save the specified preset number (1-64).
Chain Connection Highlighting	Transmit or receive messages to allow chain connected modules to highlight a specified connection path.

Bus Mode Page



MIDI UTIL Page

The MIDI UTIL page provides the following MIDI utility functions.

MIDI Monitor

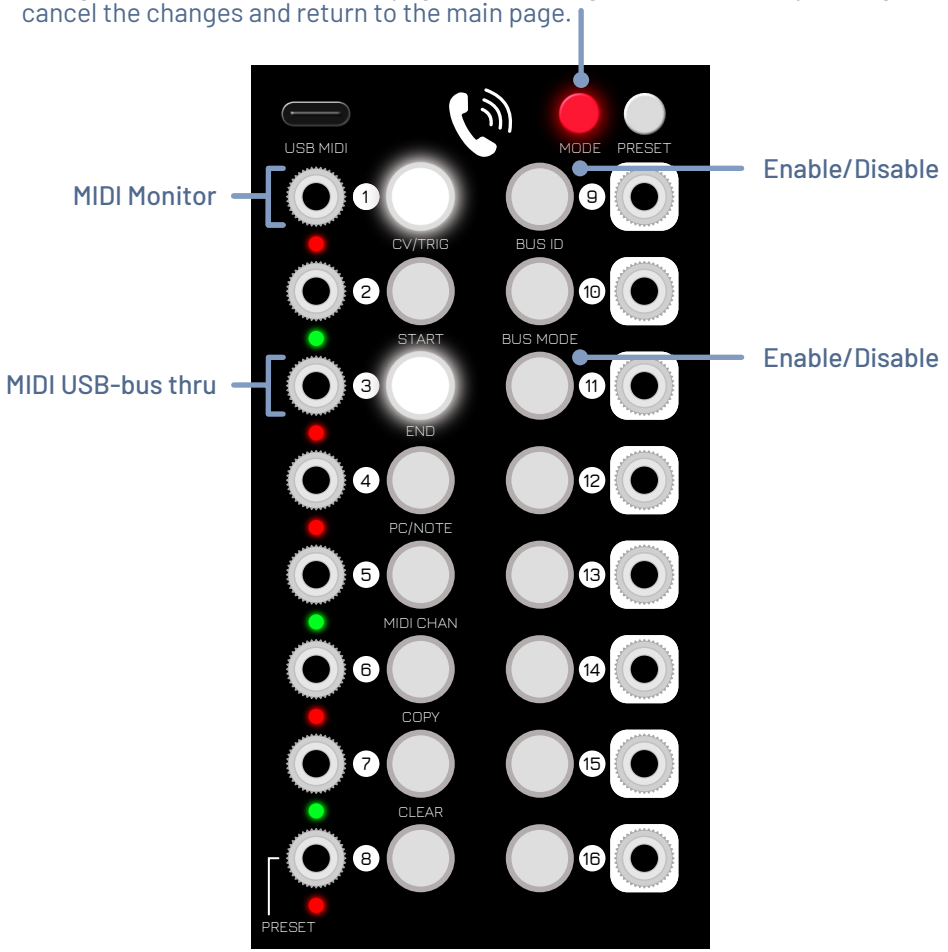
The MIDI monitor utility shows when there is MIDI activity on the USB MIDI port or on the data bus. When not in the MODE page, the MODE button light will flash once whenever MIDI data is received, unless it is already indicated by another feature, e.g. a flash to the PRESET button indicating a preset change. This can be used when testing or fault finding in MIDI connections.

MIDI USB-Bus Thru

The MIDI USB-bus thru utility passes all MIDI data from the USB MIDI port on to the data bus. This can be used to control multiple Exchanges from a single USB MIDI port by assigning different MIDI channels to each Exchange and connecting them using the data bus. The MIDI data is broadcast to all devices on the data bus.

MIDI UTIL Page

Mode Button
Glows green when settings have been changed. Press when green to confirm the changes and return to the main page. Otherwise glows red, where pressing will cancel the changes and return to the main page.



Main Page - Sequence Reset Functions

The main page has some additional functions for manually resetting preset sequences. These allow Exchange to be manually synchronised with the start of playback of a sequencer. These are accessed by holding down the PRESET button then pressing input buttons 1, 2 or 3 as follows.

PRESET + 1 (CV/TRIG): Switch to START Preset on Next Trigger

Exchange will always switch to the START preset when the next trigger is received, regardless of the current preset in the sequence. This can be used for example if the START preset is required in a looping sequence that triggers through START to END presets with an external sequencer, where the sequencer sends a trigger at the start of the sequence to select the START preset. This function gets Exchange ready to trigger the START preset when the sequencer is started. When in a random mode, Exchange will switch to the initial preset used by the random mode when the next trigger is received.

PRESET + 2 (START): Switch to START Preset Immediately

Exchange switches immediately to the START preset. This can be used to set the preset ready for the start of a sequence, without needing a trigger at the start. This can be used in combination with PRESET + 1 if this effect is desired with a sequence with a trigger at the start.

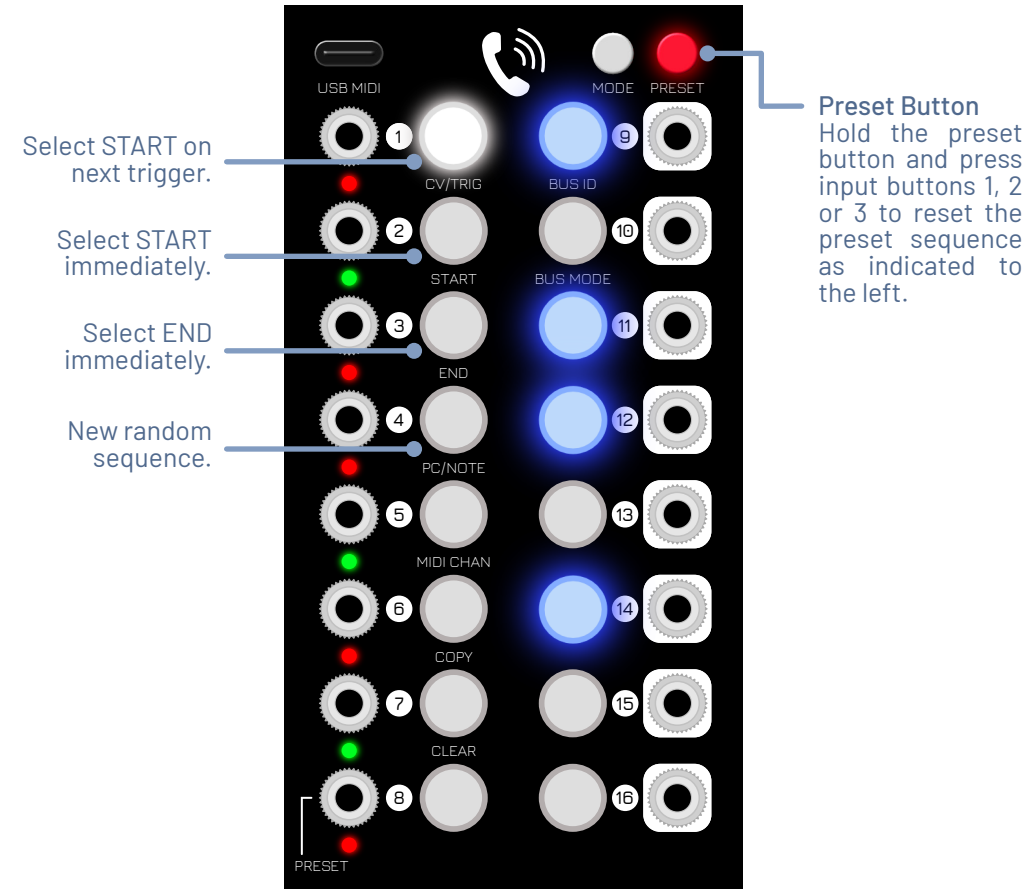
PRESET + 3 (END): Switch to END Preset Immediately

Exchange switches immediately to the END preset. This can be used in a similar way as PRESET + 1, but sets the preset as it would be just before a synchronised sequence loops back to start, with a trigger at the start.

PRESET + 4 (PC/NOTE): New Random Sequence

Exchange will start a new random sequence when the next trigger is received, when in one of the random modes. Subsequent RESET triggers will switch to the initial preset in the new random sequence.

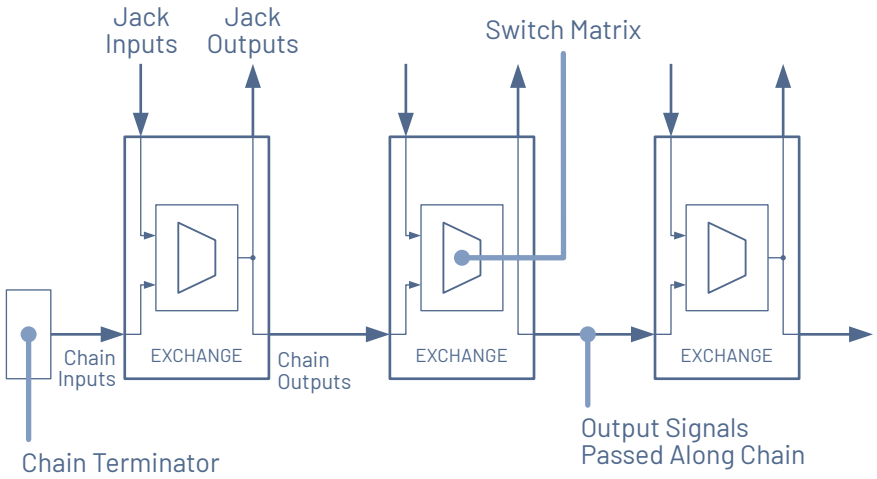
Main Page - Manual Sequence Reset



The sequence reset functions will have no effect in the preset input CV mode. The behaviour is the same for random sequences, except the random sequence will continue with a random preset on the next trigger after the reset function has completed. While PRESET is held down, buttons can be pressed multiple times to reset a sequence during a live performance.

Exchange modules can be connected together to form a chain of signal patches, without needing patch cables at the front panel to form the chain connections. The chain connections are made using the patch chain input and output connectors at the rear of the module (see Rear Panel). This allows the 8 output signals to be sent on to the next module, so they can be patched to modules further down the chain.

Note: the chain connections are made with 16-way Micro-MaTch IDC cables, available separately. These cables are orientated by aligning the connector tab with the hole in the PCB. This can be verified by checking the stripe on the cable is aligned with the label on the PCB.



The figure above shows a block diagram of how signals pass through the chain of connected Exchange modules. Each of the 8 inputs to the switch matrix can select between their corresponding jack input and chain input. The 8 outputs of the matrix go to both the jack outputs and the chain outputs. The jack and chain outputs are buffered independently of each other to prevent signal degradation. The overall effect is that jack inputs can be switched and passed down the chain, and be routed to any of the outputs where there are sufficient free routes. This allows signals to be switched and passed around a rack without cables criss-crossing the front panel.

IMPORTANT! The first input chain connector MUST be terminated by connecting a chain terminator board to avoid unexpected behaviour.

Jack and Chain Input Selection

The matrix inputs have two modes: 1) detect mode and 2) chain mode. The detect mode automatically switches the input to either the jack or chain depending on whether a jack is inserted. This is indicated by the LED beneath the jack socket where green indicates a jack connection and red a chain connection. The chain mode will select only the chain input, allowing an inserted jack input to be manually overridden.

To select between detect and chain modes, use the main page to first select an input by tapping one of the input buttons, then tap the same input again to toggle between the two modes. The button will flash once to acknowledge the mode change. If a jack is inserted during the mode change, then the LED will also toggle between red and green.

Tip: If connecting the chain between adjacent modules, to avoid excessively bending or pinching the cables, connect them so that the cables are directed away from the module edges. This way, the cables can be gently bent round in a loop between modules, avoiding a sharp bend where the connectors meet between the modules. To make it easier to insert and remove the modules from a rack, remember to use cables longer than the necessary shortest distance between the modules.

Synchronising Multiple Exchanges

Exchange modules can be synchronised so that they load and save their presets from the same bank and preset number in unison. Each Exchange may have a unique set of connections in its presets, but a change in preset in one Exchange can signal all other connected Exchanges to also change to its corresponding preset.

Preset changes received on the USB MIDI bus will also be transmitted between connected modules so a single USB connected Exchange can be used to synchronise a set of Exchange modules. Similarly, when using the preset change CV or trigger input, the preset change can also synchronise connected modules. To isolate Exchange modules from preset changes, they can be configured to optionally transmit or receive preset load or save synchronisation signals. For details of how to configure these options, see the BUS MODE Page section.

Data Bus Connections

The synchronisation of Exchange modules is achieved using the data bus connections. There are two connection options for the data bus: 1) dedicated data bus cables using connectors J2, J3 (see Rear Panel), or 2) the Eurorack power bus CV and gate connections. The connectors J2 and J3 are used by plugging a single cable into either connector between two modules. Each additional Exchange is connected in the same way to form the data bus.

Note: To use the data bus, a jumper MUST be inserted on both the data bus clock pins and data header pins J1 (see Rear Panel), as shipped. **ONE, and ONLY ONE** module in a chain should have data bus J1 jumpers inserted, all others **MUST** have the jumpers removed.

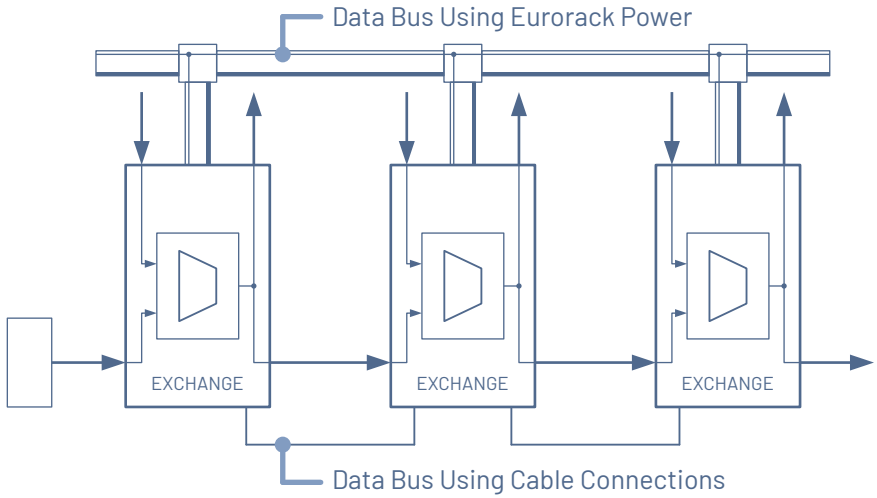
The J2 and J3 data bus connections are made with 3-way PicoBlade cables, available separately.

The Eurorack CV and gate connections can be used to synchronise Exchange modules by simply connecting them to the same Eurorack power bus. To enable this, connect the supplied jumpers horizontally on J50, see Rear Panel. It is also possible to use a combination of Eurorack and dedicated bus connectors, for example to combine two Eurorack power buses into a single data bus by joining them with data bus cables between Exchange modules.

IMPORTANT! IF USING EURORACK POWER BUS FOR DATA, ENSURE NO OTHER MODULE TYPES ARE USING THE CV/GATE CONNECTIONS TO AVOID MODULE DAMAGE!

Bus	J1	J2, J3	J50
Cable (default)	✓ (one module in chain only)	✓	×
Eurorack	✓ (one module in chain only)	×	✓

Summary of use of jumpers and connectors for the two bus options.



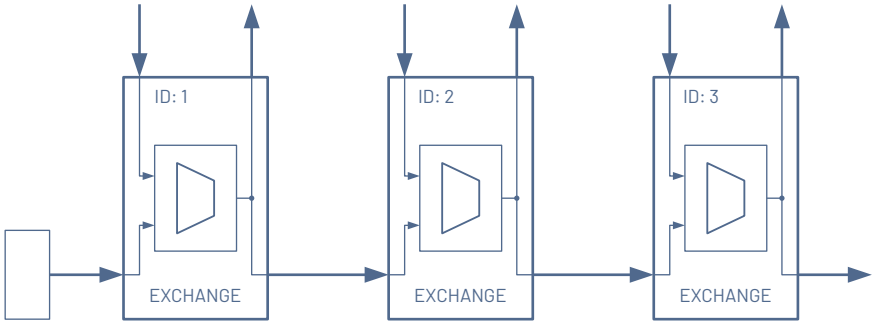
Data Bus Jumpers and Long Data Bus Connections

Exchange ships with data bus jumpers on J1. Only ONE module on a particular data bus can have these jumpers inserted. It is important to keep data bus connections to the minimum possible length to avoid corruption of the data signals. To help when long connections are used, three settings are provided on J1: 4.7K, 3.3K and 2.2K. One jumper is placed on the corresponding clock pins, and one on the data pins (see Rear Panel). By default the 4.7K pins are used but if data loss is experienced, try using the 3.3K and then 2.2K pins.

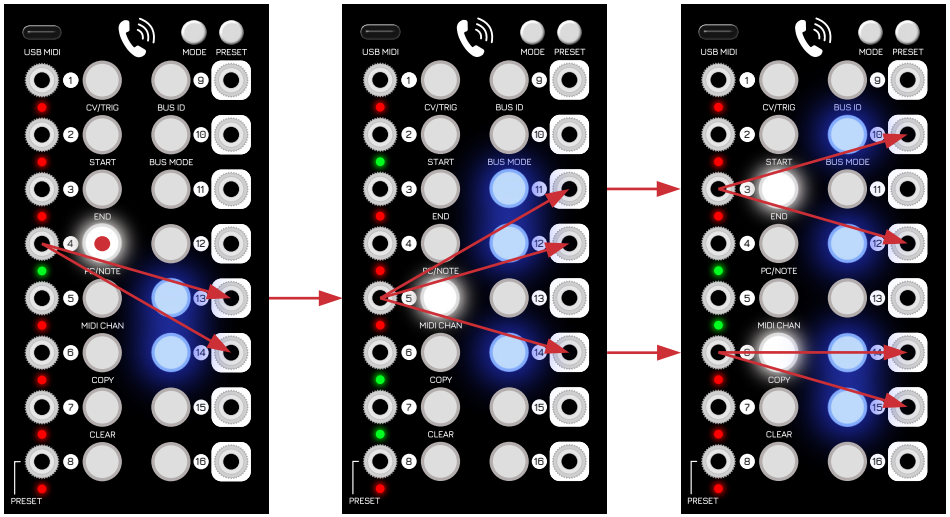
Highlighting Chained Connections

Exchange provides a way of quickly showing how connections have been made along a chain of modules. It does this by highlighting the signal paths for a selected input or output using the main button LEDs. To highlight a set of connections, hold down one input or output button in the main page. The main button LEDs across connected Exchange modules will light up to indicate that the corresponding input or output is connected to the selected input or output. When the button is released, the LEDs will revert to showing the previous input and output connections for each individual Exchange.

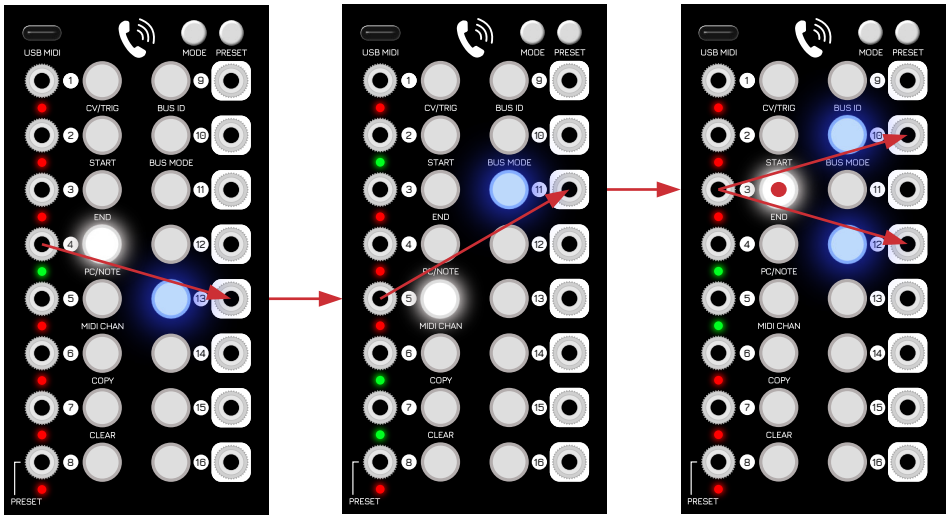
Before connection highlighting can be used, the bus ID number for each Exchange must be assigned. The assignment must follow the form as shown below. The leftmost Exchange must be assigned the ID of 1. The Exchange connected by the signal chain to right of that is the current ID+1, in this case 2. This repeats along the chain, following the path of the signal chain. If there are breaks in the signal chain, this can be represented by starting the ID after the break at ID+2 or greater, which below would be 5 or greater.



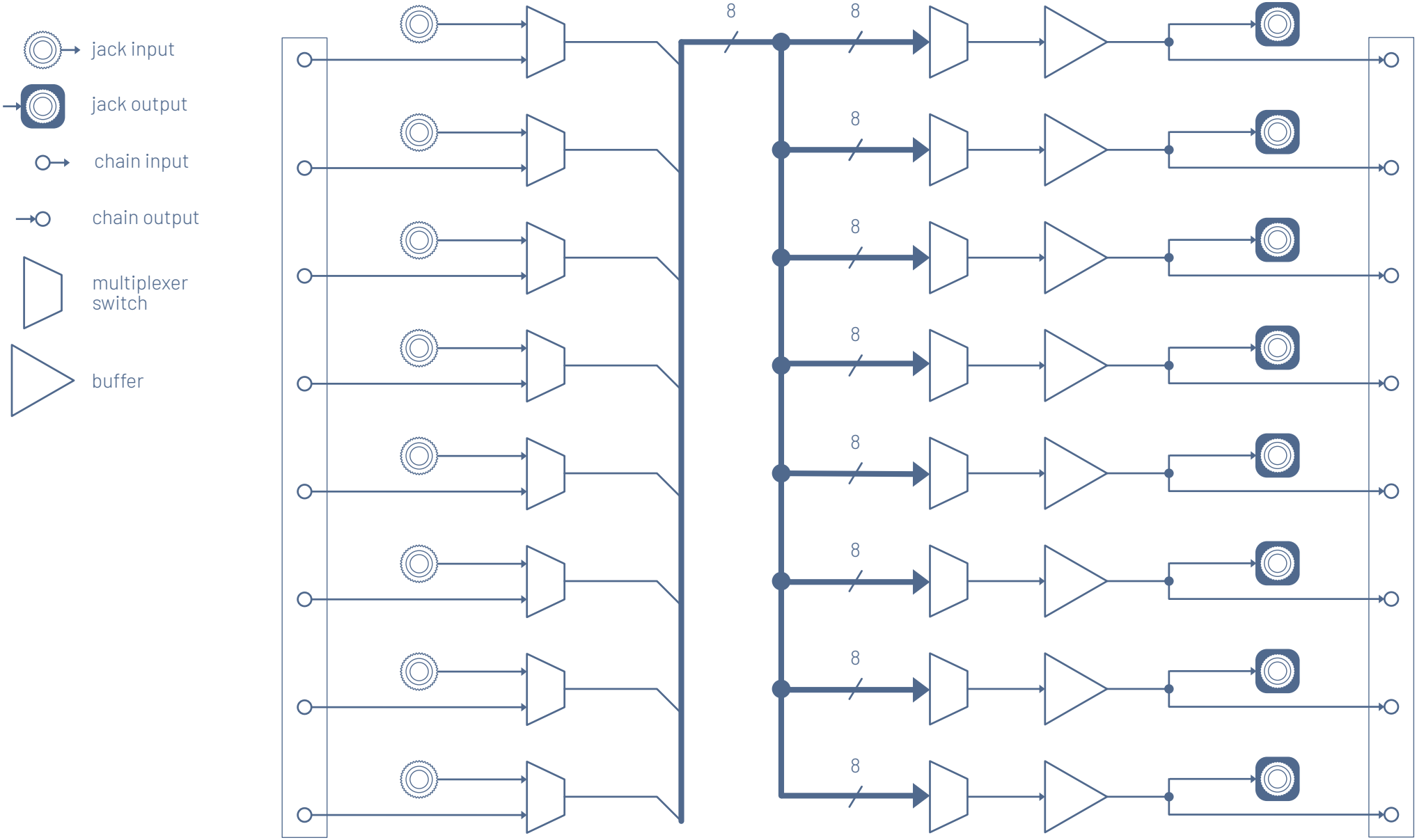
The figure top right shows a highlighting example where the red dot indicates the button being held and the red arrows the trace through the chain. Input 4 of the left Exchange is patched to outputs 13 and 14. It is connected to input 5 of the middle Exchange through the chain as chain input 5 is selected (red LED), but not to input 6 (green LED, input jack connected). Input 5 is patched to outputs 11, 12 and 14. Outputs 11 and 14 connect through the chain to inputs 3 and 6 on the right Exchange, which then are patched to the final outputs 10, 12, 14 and 15.



The same patch chain is shown below, except now, input 3 is held down on the right Exchange. Only outputs 10 and 12 will be highlighted this time as input 3 is now the start point of the highlighting trace. This input is then traced back through the chain to a single source.



Block Diagram and Connections



Updating the Firmware

New features and bug fixes are released as new firmware versions. They are made available at archaea.co.uk/exchange. The firmware can be updated by connecting Exchange to a computer with a USB cable. The firmware update procedure is as follows:

1. Turn off the power to Exchange.

2. Connect Exchange directly to a computer USB port.

3. To enter firmware programming, hold down MODE while you power on Exchange in the rack. The MODE button should be red and input 8 LED green.

4. The firmware is released as a MIDI SysEx file, with extension .syx. To load the firmware into Exchange, you need to use a SysEx utility. Elektron's Transfer utility is recommended for this as it is rate limited which makes it reliable:

   https://elektron.se/support-downloads/transfer#resources

5. Start the SysEx file transfer. In Elektron Transfer, click on the 'go to the SYSEX TRANSFER page' and select the file and Exchange from the device list. Press Send.

6. The input LEDs should turn green one by one towards the top LED.

7. The transfer is complete when the top LED is reached and Exchange will then reboot into the new firmware. If the transfer stalls, reboot Exchange manually while holding down MODE and restart the transfer.

Features

- 8×8 digitally-controlled analog patching matrix
- Signal range: -10V to +10V
- 64 programmable preset slots
- USB MIDI note/PC preset change control
- Trigger sequence/trigger random/CV preset change input with programmable preset sequence range
- 8 patch chain inputs and outputs (on module rear)
- Programmable selection between an individual chain and jack inputs
- Automatic detection of input jack insertion, and switching between chain and jack inputs
- Highlighting of connection routes for inputs/outputs across chained modules
- Data Bus for synchronising presets and highlighting connections across multiple modules

Measurements

Width	12HP (60.7mm)
Height	3U (128.5mm)
Depth requirement for skiff/rack	39mm (including power header)
Current requirement	12V: 7.7mA, -12V: 7.4mA, 5V: 93mA

Factory Presets

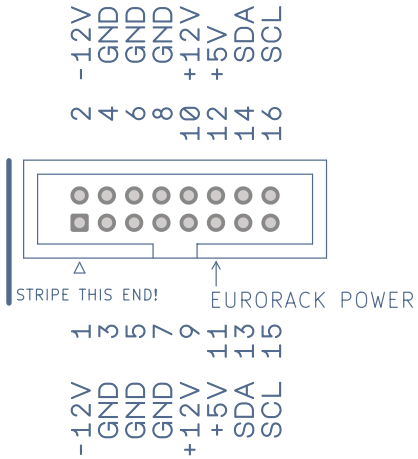
Bank	Description
1	Inputs 1-9 are patched to the corresponding outputs 9-16. The outputs are shifted by one place down with each subsequent preset in the bank.
2	Inputs 1-8 are patched to output 9. The input patched to output 9 corresponds to the preset in the bank. This is the default sequence as set by START and END.
3	Input 1 is patched to outputs 9-16. The output patched to input 1 corresponds to the preset in the bank.
4	Input 1 is patched to outputs 9-16 as a buffered multiple. The total number of outputs patched to input 1 corresponds to the preset in the bank.
5	Empty
6	Empty
7	Empty
8	Empty

Pin Outs

Data Bus

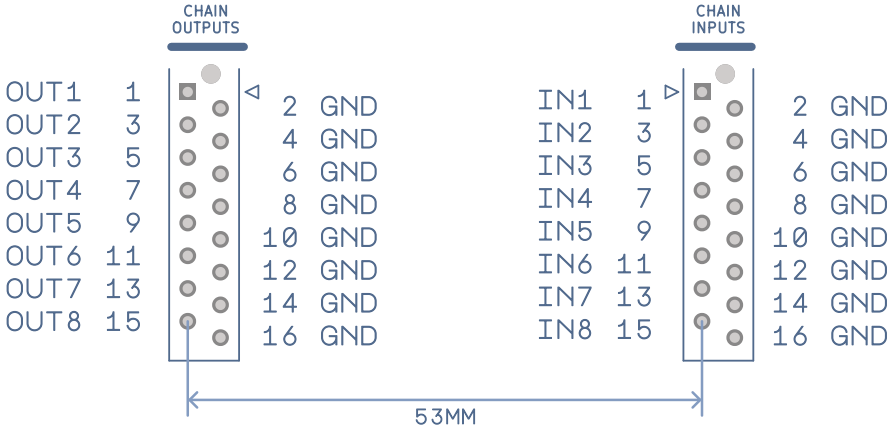
The data bus connections are made with Molex Picoblade 3-way connectors and carry the I2C protocol lines SDA, SCL, and a ground line.

The data bus SDA and SCL lines are also optionally available on the Eurorack power connector (see section Rear Panel Connections).



Chain Inputs and Outputs

The patch chain connections are made with TE Micro-MaTch 16-way connectors and carry 8 analog lines interleaved with 8 ground lines.



Revision History

This document applies to the most recent firmware release.

Firmware Revision	Date	Feature Change Set
1.1	17/3/25	• USB MIDI Program Change message transmit from preset change • MIDI note message control over input-output connections and input mode • MIDI utilities page: MIDI monitor, MIDI USB-bus thru
1.0	15/12/24	Initial release.