

ComPair

Dual/window threshold and signal comparator

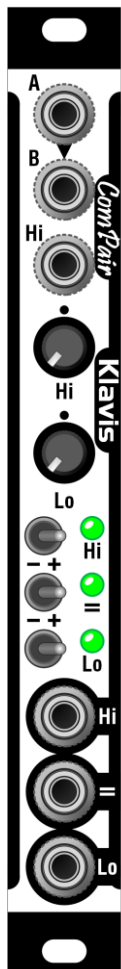
Overview

The ComPair is a highly versatile while compact module that can handle all kind of voltage comparison duties in audio, modulation and logic purposes.

Two sections can be used independently or combined as a unified window comparator. Window comparison goes beyond simple “higher/lower than”, and checks if a signal is within a specific range.

Besides the usual voltage setting potentiometers, there is an offset input jack on the first section to allow voltage against voltage comparisons, leading to a 3-signal comparison capability.

A main differentiating feature of the ComPair is the possibility to invert and mute each of the comparison results on the 3 output jacks. Dedicated LEDs indicate the current status of each output.



Features

- Different usage modes
 1. As two independent threshold-to-signal comparators
 2. As a single window comparator
 3. As a voltage-to-voltage comparator
 4. As a 3-signal voltage comparator
- For each comparator
 - Input and output jacks
 - Threshold potentiometer
 - Above/Below/Mute 3-position switch
 - Signal active LED indication
- Window comparison has its dedicated switch and LED
- The first comparator has an additional input for signal-to-signal comparison with offset.
- All outputs allow direct Oring by simple shorting via a multiple
- Compact module
- Aluminium front panel
- Compact and skiff-friendly module

Installation and security

Purpose

This module is meant for installation in a Eurorack-compliant chassis. It adheres to Doepfer Eurorack mechanical and electrical specifications.

Do not attempt using this module in other mechanical or electrical contexts.

Installation

Before the installation, disconnect the mains power supply from your modular system. Some power supplies are not safely isolated; there is a risk of injury!

See in the specifications if this module requires 5V from the supply rails. If 5V is needed and your rack is not providing 5V, do not attempt connection!

Check that the current consumption requirements of this module, when added to your installed set of modules do not exceed the available current from your supply. This is done by adding up the current draw of all modules (mA) separately for each of 5V, 12V and -12V rails. If any of these 3 sums exceeds the available current of your supply for that voltage, do not connect the module to your system; you need a stronger power supply.

The provided supply flat cable can only be inserted in the appropriate orientation at the back of the module, so there is no risk of error on that end. However, you should pay attention to the orientation of the cable in the socket of the supply PCB inside your chassis. Cheap sockets without shrouding may allow you to plug in the connector the wrong way!

The red stripe on the cable should match a stripe printed on the supply board. The stripe also indicates the -12V side. In case there is no stripe, a -12V marking is a safe indication of the orientation.

Double check that the connectors are fully inserted and correctly oriented before switching on the power supply. In case of an anomaly, switch off the power supply immediately and check everything again.

Quick overview

The ComPair accepts analog input signals (Audio, LFO, ...) and outputs digital signals (gate, trigger, ...). Inputting digital signals is allowed but usually less useful.

The module allows comparisons against a signal and either: a threshold, another signal, or a window defined by high and low settings.

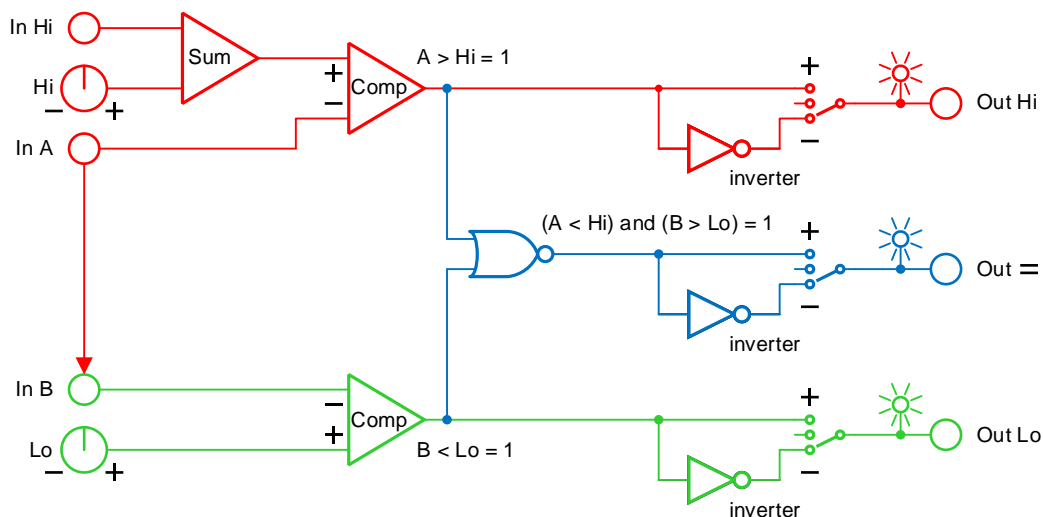
The module can be patched/used to get either:

- two distinct signal-to-threshold comparators
- one signal-to-threshold comparator plus one signal-to-signal + threshold comparator
- one signal-to-window comparator
- 3-signal comparison logic

The A and B sections are combined to create a third output (=), when used as a window comparator.

By default, comparator A output is active (outputs positive voltage) only when the A signal is **above** the threshold. Conversely, comparator B output is active when the B signal is **below** the threshold. Finally, the window comparator output is active when the A signal is between the Hi and Lo limits.

We see how input A is internally fed into input B when there is no Jack inserted into input B. Section A offers a dynamic setting option thanks to a dedicated CV (Hi) input.



Potentiometers

Threshold for comparators A (Hi) and B (Lo)

Potentiometers A / B set the threshold against which the A / B input voltage will be compared to. Hi is for High threshold, and Lo for Low threshold.

The threshold levels span from -10V to 10V, with zero Volt (neutral) in the middle.

Inputs

The inputs are the three jacks in the upper part of the module

Signal input for comparator A (A)

This input receives the signal to be compared to the sum of Hi threshold setting plus the signal from input Hi.

Signal input for comparator B (B)

This input receives the signal to be compared to the Lo threshold setting.

When no plug is inserted, this input jack is fed with the signal from input A; when a plug is inserted in B, this internal connection is disabled.

Signal input for signal-to-signal comparison (Hi)

This input receives a signal that can be compared with the input signal A. Note that the Hi setting adds an offset to the Hi signal.

Outputs

The outputs are the three jacks in the lower part of the module, each with its associated switch and LED.

Signal output of comparator A (Hi)

This output provides the result of the comparison between A and potentiometer Hi. It goes high (10V) when the A signal is higher than the Hi setting.

Signal output of comparator B (Lo)

This output provides the result of the comparison between B and potentiometer Lo. It goes high (10V) when the B signal is lower than the Lo setting.

Signal output of the window comparison (=)

This output provides the result of the window comparison (cf. Window comparison section). It goes high (10V) when the signal is between the Hi and Lo settings.

Switches

Three switches are available to invert or mute the outputs.

From left to right, each switch can be set to: inverted [-], muted, and normal [+] setting.

Inverting the result of comparison is useful if we want to reverse its behavior: instead of being active when the signal is corresponding to the comparison, it becomes inactive in such case.

The same logic applies for the other switches

Inverting the result of the window comparator makes it active when the signal is **outside** the window range. In such case, the input signal can be above OR below the window settings.

Shutting down the result of a comparator can be useful to manually trigger an effect, but having it silent the rest of the time.

LEDs

The three LEDs located next to the three switches (Hi, =, Lo) provide an indication of the current state of the output after the inversion and mute setting. So they reflect the exact electrical behavior of the output jacks

When lit, there is a positive voltage present; when off, there is no voltage.

User Mode

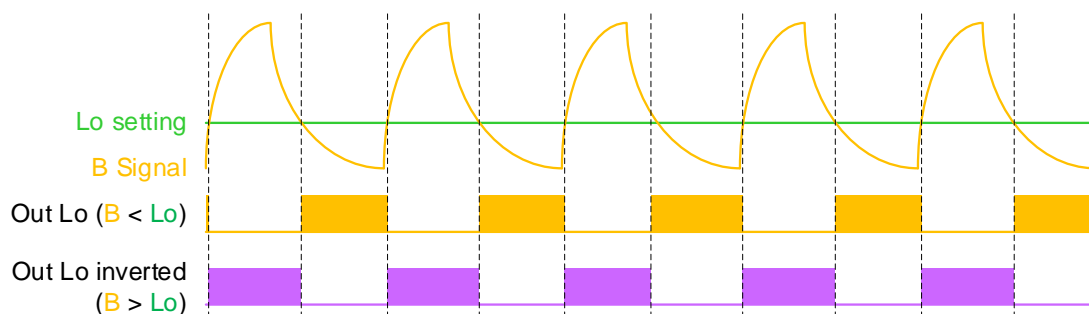
Simple threshold comparator

Using comparator B

For this example, we use section B, as it is the simplest of both sections.

We provide the signal to be compared in input B. The threshold is set via potentiometer Lo. Switch Lo is set to [+]. Result is available at output Lo : the output signal is active when the input signal is **below** the threshold set.

We can invert the result of the comparison, that is to say make it active when the signal is **above** the threshold, by setting switch Lo to position [-]. We also can mute the output by setting the switch to middle position.



Using comparator A

As above, but using input A, potentiometer Hi, switch Hi and output Hi.
The Hi input is left unused.

Contrarily to comparator B, here, the output signal is active when the input signal is **above** the threshold set.

Each section being fitted with an inverter, allows them to be interchangeable.

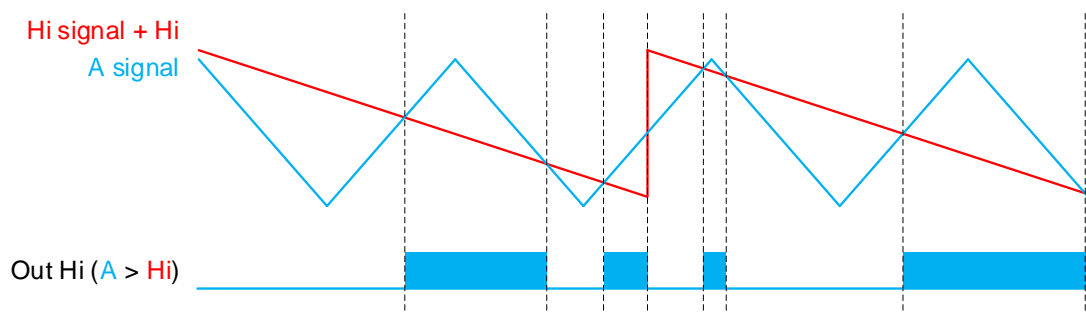
Signal-to-Signal comparison

This is a feature only available on comparator A.

The two signals we want to compare against each other are brought to inputs A and Hi.

The signal Hi can be offset by potentiometer Hi. When the Hi is set halfway, there is no offset (= zero volt). The output signal is active when the A input signal is **above** the sum of potentiometer Hi and input signal Hi.

If needed, the signal can be inverted [-] or muted.



Window comparator

overview

This feature requires using both comparators (A and B). All three outputs will be derived from the window comparison.

A window comparator is about determining if a signal is within a defined voltage range. This is reflected at output [=]. Otherwise, outputs Hi and Lo will indicate if the signal is above or below the window range.

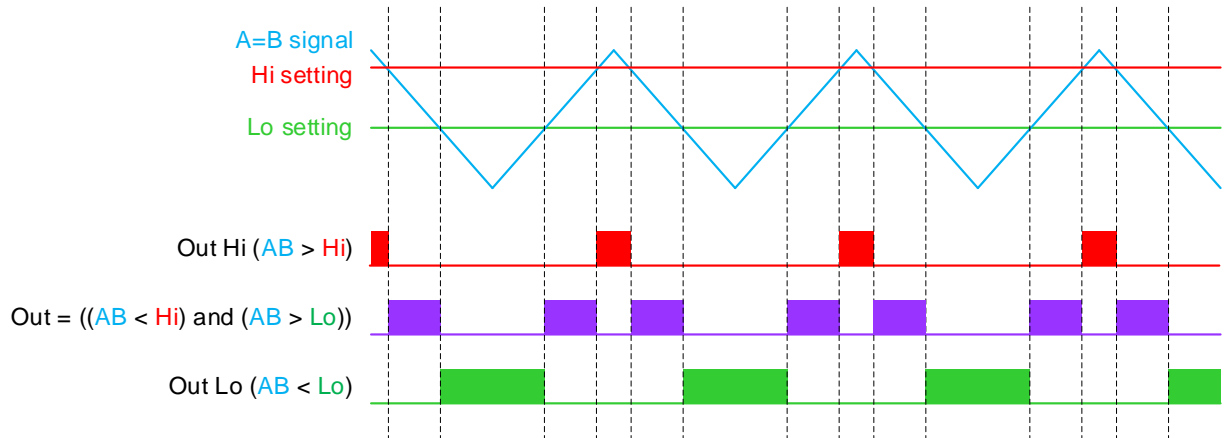
Procedure

We provide the signal to be compared in input A. We don't connect anything into input B. By default, we don't connect anything to input Hi neither. The potentiometer Hi and Lo are used to define the upper and lower limits of the window range.

With all switches set to [+]:

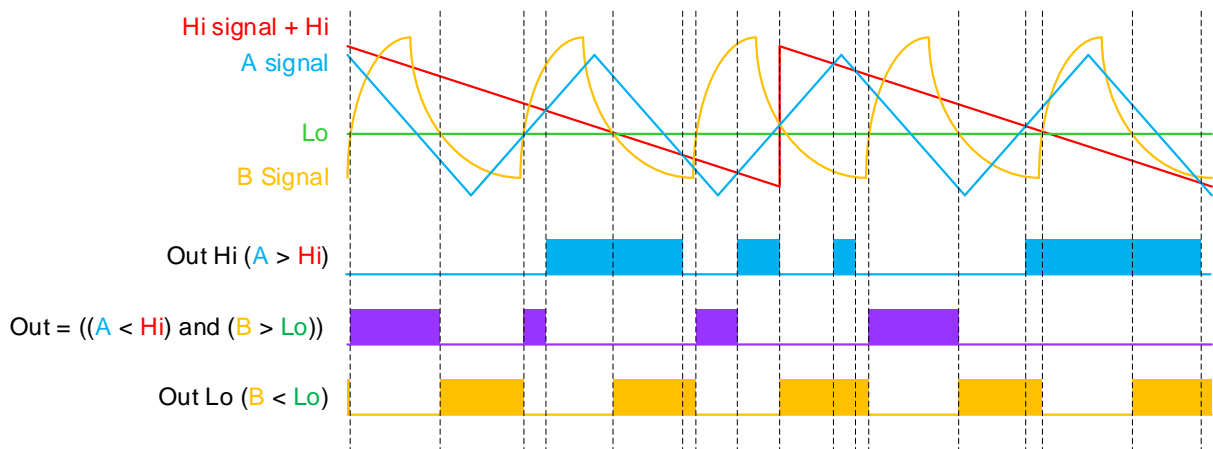
- output Hi is active if the A input signal is above the window range
- output [=] is active if the signal is within range
- output Lo is active if the signal is below range

Note that with switch [=] set to [-], the output [=] is active when the signal is above **or** below the range.



Three signal comparison

This example combines the comparison between two signals on inputs A and Hi against each other before comparing that result against signal B.



Using output [=] when not in window comparator mode

The output [=] is usually used in window comparator mode. When used in the context of two independent comparisons, the [=] output signal will be active if outputs of comparators A and B are both inactive (with all switches [+]).

ORing the outputs

When low, the outputs are passive allowing to “OR” multiple outputs, that is to say join them into a “multiple” or similar device normally meant to distribute one signal to multiple destinations. Practically, as long as at least one of the participating signals is at high level (logic one), the result will be high.

This Oring feature is also offered in the Logica XT and Two Bits logic modules from the Klavis range.

Specifications

Mechanical

Dimensions	mm	inches	Eurorack compliance
Height	128.40	5.06	3HE
Width	15.00	0.59	3hp
Depth behind panel	28.8	1.13	

Supply

The supply socket is protected against reverse insertion.

Supply rail	Current draw
+12V	22 mA max.
-12V	11 mA
+5V	0 mA

Input/output

All inputs and outputs can withstand signals between -12V and +12V without harm.

Jack	Effective voltage range received or generated
Inputs	+/- 10V min.
Outputs	Logic 0/10V , direct ORing capable

Signals

Parameter	Values
Frequency range	DC to beyond audio

Packing list

The box contains:

- ComPair module
- 2x M3 black mounting screws + washers
- Eurorack-compliant 10/16-pin supply cable

Klavis products, including PCB and metalwork, are designed and manufactured in Europe.