



# МИНСК

OPERATOR'S MANUAL Rev. 1949/1.0

STEREO IMAGE  
PROCESSOR

Model of 1949

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# WORKING CLASS ELECTRONICS®

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## MAIN FEATURES

*Stereo image manipulation tool*

*Mid/Side processing*

*Mono to faux stereo conversion*

*Stereo dimension enhancement*

*Manual and CV stereo width control*

*Low cut on side component*

*Visual stereo image indicator*

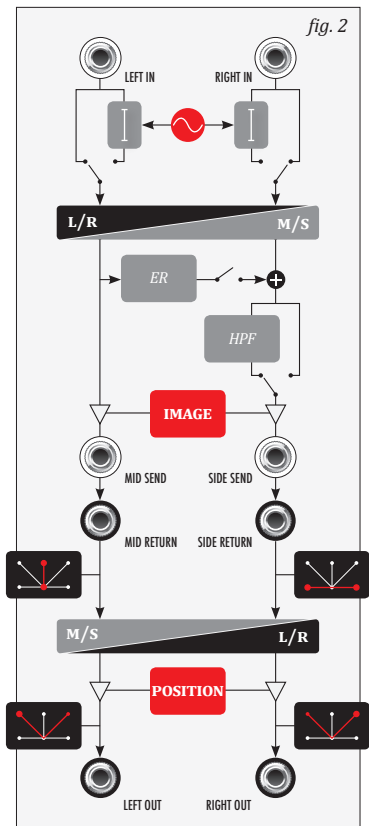
## TECHNICAL DETAILS

*Eurorack synth compatible*

*6hp, skiff friendly*

*Current draw: +140mA/-40mA*

*Reverse power protection*



**SYMMETRY CONTROL**

The **POSITION** knob allows for manual adjustment of L and R balance should the final stereo output seem skewed. For the sake of precision, the range of operation is limited to +2/-12dB.

**GONIOMETER**

A stereo image indicator with six LEDs arranged along vertical, horizontal, and diagonal axes offers an important insight into potential problems in the signal. For a proper stereo signal, all six LEDs should be lit or blink. If the horizontal pair of LEDs remains dark, it means no significant components in S are present (in other words, the signal is mono, or the stereo image is very narrow). If the pair of vertical LEDs is dark, this means the channels are out of phase. The two yellow LEDs at the diagonal indicate the strength of the final left and right outputs (after symmetry adjustment).

**SIGNAL LEVELS**

In general, mixing two hot signals may yield clipping distortion due to the low headroom present in Eurorack. In Mińsk, the L/R to M/S conversion is quite safe due to scaling by 1/2. However, be careful with the **IMAGE** control as it introduces up to 2x gain to the S component. This may cause distortion if the original L and/or R signals transmit out of phase components exceeding 10Vpp (a rare case).

On the other hand, conversion from M/S to L/R does not involve scaling. This part of the circuit is fully analog and it may clip if the M and S signals patched to the respective inputs are over 10Vpp. Also, extreme symmetry correction may introduce distortion due to the additional gain. To avoid compromising audio quality, please observe the amplitude of the input and output signals.

**ACCESSORY**

Our Coal Mine black panels are available for all of Xaoc Devices modules. Sold separately. Ask your favorite retailer. •

## DIMENSION EFFECT

*Mińsk offers two methods of adding a feeling of dimension to the audio signal. It may be used either for enhancing the existing stereo pair or for creating a faux stereo image from a mono source patched into the **LEFT/MONO** input. Please note, the effect is most noticeable with complex and dynamic audio content.*

*The **DIMENSION A** variant is based on the Haas effect. A short and very slowly varying delay is introduced between the left and right channels. This varying delay confuses the human auditory system that relies on an inter-aural time difference to locate sources in the stereo field. In practice, it translates to a subtle animation of the stereo image that is in constant motion and thus perceived as “ethereal”.*

*The **DIMENSION B** variant is based on early reflections as present in most reverberant spaces. In recording techniques that capture an acoustic scene by using multiple microphones, the perception of spaciousness relies mostly on the presence of wall reflections. We simulate this effect in Mińsk using an ER network from popular algorithmic reverbs. Its output is mixed with the side signal and the degree of spaciousness is adjusted with the **IMAGE** control.*

## LOW CUT FILTER (SIDE HPF)

*Eliminating off-axis low end is a common requirement for vinyl cutting and other media. Mińsk facilitates this by applying a high pass filter to the S component. The switch offers three settings: **300**, **50** and **OFF**. At 300Hz, the filter slope is 12dB/oct, while the 50Hz setting uses a steeper 24dB/oct slope. Please*

*keep in mind, this filter does not affect the M component, therefore its impact on the tonal balance should be marginal (unless the mix is rather unorthodox).*

## STEREO IMAGE WIDTH CONTROL

*The center **IMAGE** knob and the respective CV input control the width of the stereo image by applying a variable gain to both the M and S components.*

*With no CV at the input, the middle position of the knob (marked **MID+SIDE**) does not affect the signal. When turned CCW it reduces the amplitude of the S component thus narrowing the perceived image down to mono. When turned CW from the middle, it increases the gain of the S component while simultaneously reducing the gain of the M component to maintain the overall signal energy. This artificially widens the stereo image while creating a hole in the middle of the scene. At the maximum (**2·SIDE**) position there is only S and no M, which translates to the L and R signals being entirely out of phase. This setting should be used very carefully because such a signal is not compatible with mono reproduction and will sound bad on many PA systems.*

*With a CV source patched to the **IMAGE** input, the **IMAGE** knob acts as an offset, i.e. the incoming CV adds to the position of the knob. The range of 0-10V corresponds to turning the **IMAGE** knob from **MID** through **MID+SIDE** to **2·SIDE**. With the knob in the **MID+SIDE** position, a bipolar  $\pm 5V$  signal is needed for full range modulation. With the knob set at **MID**, bipolar modulation moves the side component through zero—negative values yield mirroring of the stereo image (L and R are flipped).*

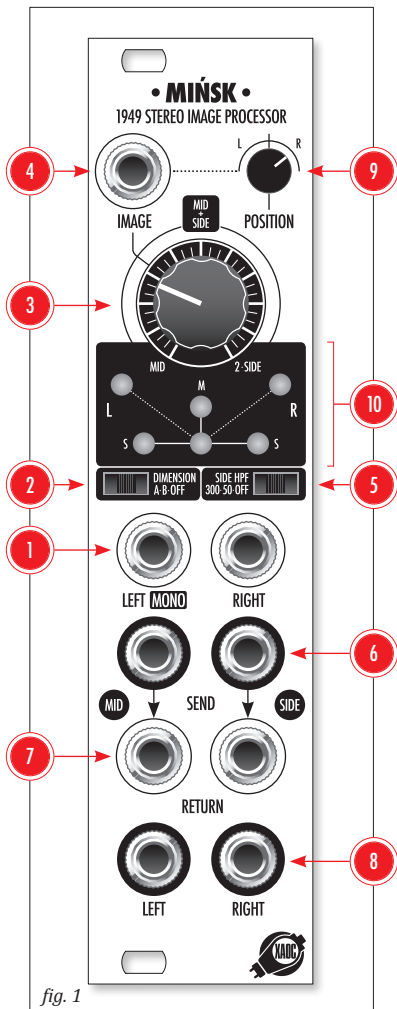


fig. 1

ed for the exact cancellation of components that are identical, but out of phase. What is sometimes surprising is that applying the same sum and difference to *M* and *S* reverts the whole process—which is precisely how we get back to left (*L*) and right (*R*) at the end.

Bear in mind that *M/S* representation will not magically separate sounds that are center panned from those which are off-axis. The *S* signal contains only those components of the audio signal that are in opposite phase in the left and right channels and that are canceled out when the audio is reduced to mono. It mostly represents the part of the stereo signal which differentiates it from mono audio. If a sound is hard-panned, i.e. it is present only in one channel (either left or right), it is split into equal parts with 50% present in the *M* and 50% in the *S* channel.

Nevertheless, having the mid and side information separated allows for dynamic processing, equalization, and other effects to be independently applied across the depth and width of the auditory image. Besides special effects, an important advantage is that separate or even completely different treatment of both mid and side signals retains the overall balance and symmetry of the scene.

Patch a stereo signal into the **LEFT** and **RIGHT** inputs. Take the *M* and *S* signals from the **SEND** pair of jacks, process both *M* and *S* signals and feed the resulting pair into the **RETURN** jacks. The processed stereo pair will be available at the bottom **LEFT** and **RIGHT** jacks.

You can also experiment with replacing one (or both) of the *M* and *S* with something entirely different.

## SALUT

Thank you for purchasing this Xaoc Devices product. Mińsk is a stereo image processor. It is a hybrid tool that combines digital and analog processing to facilitate advanced mid/side (M/S) manipulation of a stereo signal pair. It allows for separate treatment of the mid and side components, which affects the depth and width of the auditory scene.

Mińsk offers both manual and voltage control of the stereo width, as well as two dimension effects for enhancing the existing stereo image or creating a faux stereo image based on the stereo or mono input source. Because it can eliminate out-of-phase low-end frequencies, Mińsk is especially handy during the preparation of a vinyl release or before a club concert.

## INSTALLATION

The module requires 6hp worth of free space in the Eurorack cabinet. Before powering on, the ribbon-type power cable included with the module must be plugged into the bus board, paying close attention to polarity orientation. The red stripe indicates the negative **-12V** rail and should point in the same direction on both the bus board and the unit. Mińsk is internally secured against reversed power connection, however, flipping the 16-pin header **MAY CAUSE SERIOUS DAMAGE** to other components of your system because it will short circuit the +12V and +5V power lines. Always pay particularly close attention to the proper orientation of your ribbon cable on both sides! The module should be fastened by mounting the supplied screws before powering up. To better understand the device, we strongly advise the user to read through the entire manual before use.

## MODULE OVERVIEW

The front panel of Mińsk is shown in fig. 1. The stereo pair of signal inputs ❶ is AC-coupled and accepts all Eurorack signal levels (up to 20Vpp), however, a conservative 10Vpp level is recommended (see the "Signal Levels" section at the end of this manual). The **LEFT/RIGHT** signal pair is translated to a mid/side pair, and subject to an optional stereo enhancement process engaged by the 3-position **DIMENSION** slider switch ❷. The width of the stereo image is controlled by the **IMAGE** knob ❸ and external CV patched into the **IMAGE** jack ❹. Mińsk offers an optional low cut (high pass) filter applied to the side signal and enabled by the **SIDE HPF** switch ❺. The processed and enhanced pair of mid and side signals is available at the **SEND** pair of jacks ❻. You can apply various external processing to either of these and patch the resulting signals to the **RETURN** jacks ❼. There is an internal normalization from **SEND** to **RETURN**. If the **MID RETURN** and/or **SIDE RETURN** jacks are left unpatched, the signal from the **SEND** outputs is sent straight to the **RETURN** inputs. The mid and side pair is converted back to normal stereo and is available at the bottom pair of **LEFT** and **RIGHT** jacks ❽. The **POSITION** knob ❾ adjusts the **LEFT** and **RIGHT** output balance. A set of six LEDs arranged in a setup similar to the traditional goniometer ❿ indicates the strength of the signal along virtual spatial axes.

## MID/SIDE PROCESSING

The principle of M/S processing is simple. The M signal is obtained by a scaled sum of both left and right signals, while the S signal is a scaled difference of them. Precision is need-