

# The **RoentDek** LogX4 Logic module for NIM signals

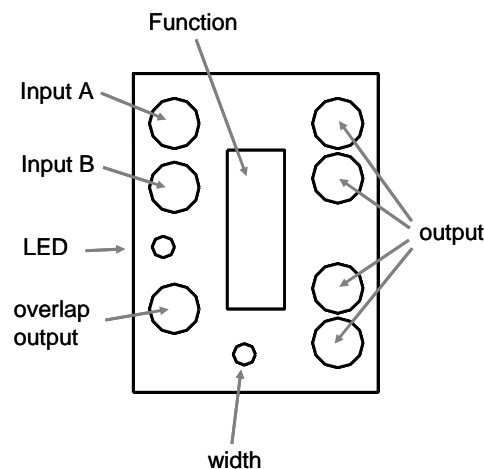
The **RoentDek** LogX4 module provides logic operations between two NIM signals of status “high” or “low”. “High” is defined as negative 0.8V on 50 Ohm (-16mA), i.e. standard NIM level, and “low” as 0V (0A), i.e. absence of a signal.\* All 16 possible operations can be addressed, i.e. outputs for 8 different logic operations (like **AND**, **OR**, **EQ**, ...) and their inversions can be obtained. By combining several of the 4 independent channels, logic operations between more than two NIM signals can be realized. It is thus possible to generate a **Gate&Delay** function for a NIM signal using two channels.

The **LogX4** module is designed as a standard 1/12 NIM case and usually requires a NIM-bin for operation (with +/- 6V). An external mains adapter 100-250 VAC is also available.

Each channel has lemo inputs on the front panel for two NIM signals A and B. The band width of the in-/outputs is 300 MHz (approximately 1 ns minimum rise/fall time) with 50 Ohm impedance. The logic function between the two digital NIM signals A and B is selected by a dip switch on the front panel. Its 10 possible numbers 0 to 9 code the logic functions according to the table below:

## Code Function

0	0
1	not (A or B)
2	<b>A</b>
3	A or (not B)
4	<b>B</b>
5	B or (not A)
6	<b>A or B</b>
7	1
8	<b>A and B</b>
9	A EQ B



**Three different output types** can be obtained (via lemo sockets on the front panel)

- direct output of the logic operation (overlap output)
- shaped output (with trailing edge of “high” level according to signal width adjustment)
- the inverted shaped output

*Figure: front panel of LogX4. The range selector switch is behind the black cover*



\* The default switching threshold is 0.3V on 50 Ohm.

The overlap output delivers the direct result of the logic operation between signal inputs A and B according to the selected code function. It has a dead-time of 5 ns for two consecutive signals, i.e. when operated as an OR.

On the shaped output this overlap signal is transformed into a NIM signal with adjustable length between 4 ns and 20  $\mu$ s by a potentiometer and by a range selector switch on the front panel (200 ns, 2  $\mu$ s or 20  $\mu$ s), independently for each channel. Note, that the shaped output may not show all signal transition of the direct output if the width is too long. The dead-time between two signals at lowest width setting is 10 ns.

The outputs from one channel can be used as input on the next channel for another logic operation. Thus, logic operations between more than two signals can be realized.

In particular, it is possible to create a **Gate&Delay** function for a NIM signal by connecting it to the A inputs of two channels: The first channel uses function code 2 and its shaped output is connected to the B input of the second channel with function code 1. The shaped output of this second channel is then a NIM signal delayed according to the width of the shaped output from the first channel and with a width according to potentiometer/switch settings of the second channel.

The maximum delay and signal width are 20  $\mu$ s. Note, that the actual width of such a Gate&Delay signal may be reduced if a consecutive signal enters the circuits too early, depending on the selected range: the dead time for the next signal is the sum of selected delay, selected width plus 10% of the selected total width range (i.e. + 20 ns, + 200 ns or + 2  $\mu$ s, respectively).