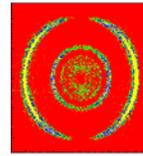


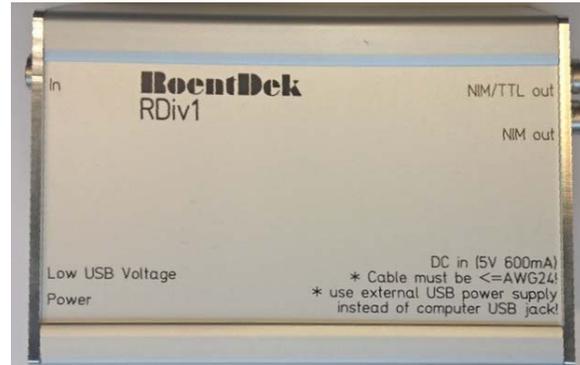
# The **RoentDek** RDiv1 150 MHz rate divider



**RoentDek**  
Handels GmbH  
Supersonic Gas Jets  
Detection Techniques  
Data Acquisition Systems  
Multifragment Imaging Systems

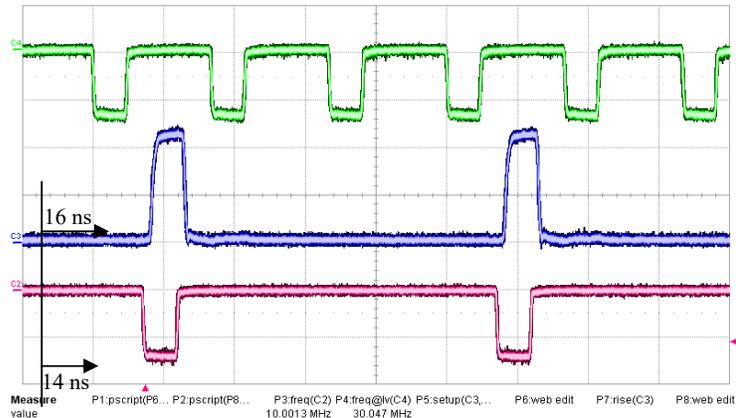
The **RoentDek** RDiv1 rate divider is a module to reduce the frequency of incoming digital signals (NIM or TTL), i.e. from a clock or a trigger output of a pulsed device (for example a Laser driver) by a selectable (integer) factor R (R is the ratio of output frequency to input frequency).

The **RDiv1** can operate up to > 150 MHz input frequency (connected via lemo socket), R can be selected between 1:2 and 1:256. Lemo sockets provide NIM and TTL (or 2x NIM) outputs depending on internal jumper setting. Power is supplied via USB cable. The case measures 104 mm x 65 mm x 36 mm (without sockets). Opening the top let allows board access for adjusting jumpers to set the output level, signal width and to the dip switches for setting R.



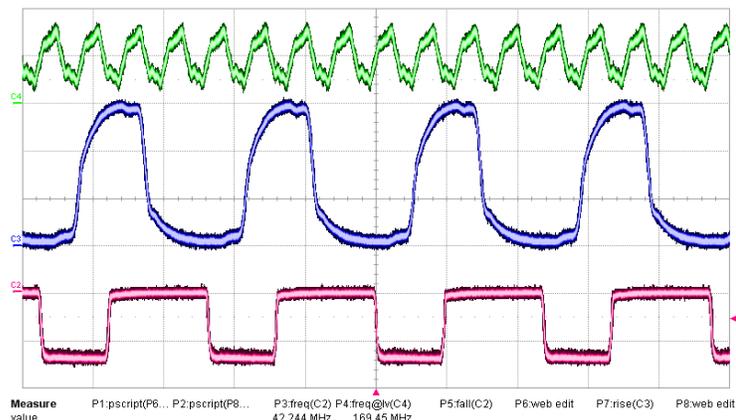
Output signal width can be increased from approx. 10 ns to about 35 ns (the latter only if output frequency allows). Minimum input signal width is 3.5 ns. Screen shots below show the response of the **RDiv1** to an input frequency of about 30 MHz for R = 1:3 and 170 MHz for R = 1:4.

Right picture: Screen shot of input trace (green) and TTL/NIM output traces (blue/red) at 30 MHz input frequency and R = 1:3.



The trigger level for 50Ω NIM input is -0.35 V, for TTL +1.7 V (+1.4 V at 2 kΩ input impedance). There is virtually no lower input frequency limit for the rate divider counting circuit. The output signal is delayed towards the input signal by about 15 ns.

Next picture: when input frequency (fast TTL Oscillator, green trace) is pushed to 170 MHz (R is set to 1:4) both the TTL (blue trace) and NIM (red trace) output frequency show distinct transitions, however, signal shapes develop somewhat slower raising/falling characteristics once the specified maximum output frequency of about 80 MHz is approached.

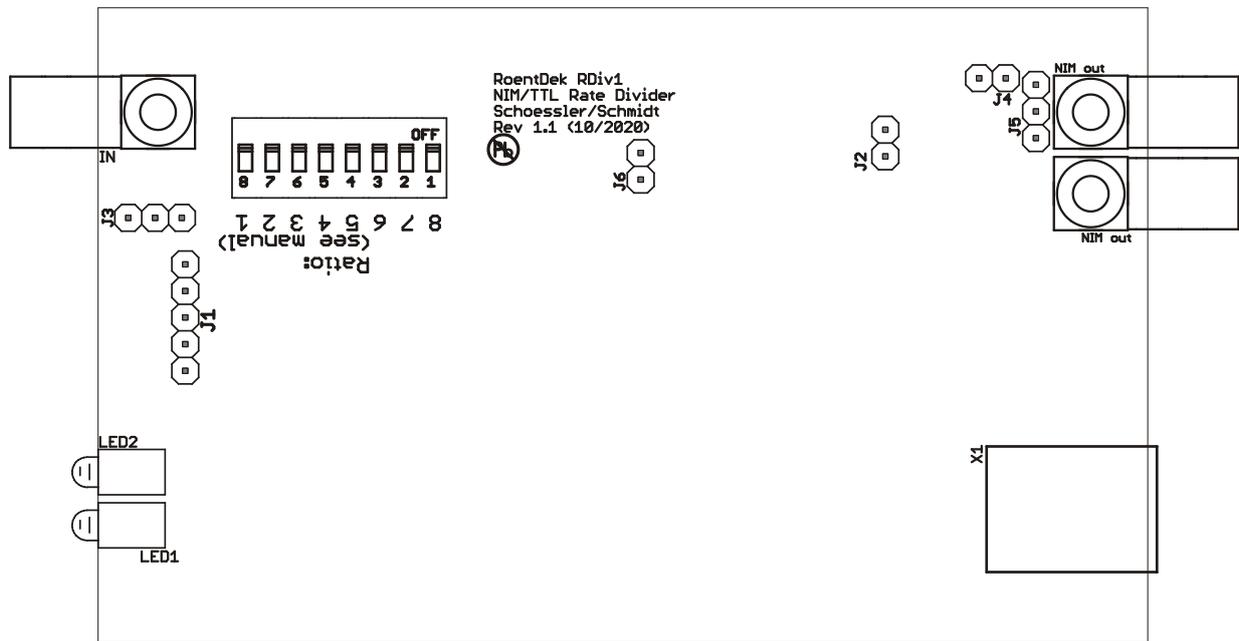


# Jumper Settings for **RoentDek** Rate Divider RDiv1

Document revision: 2023-May-05

(please note that older documents show wrong settings for switch S1!)

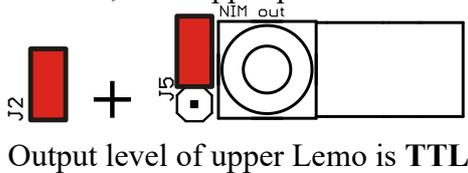
The following jumpers may be altered on the RDiv1 board (Revisions 1.1 or higher):



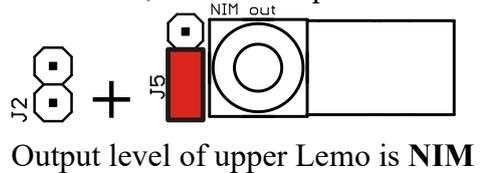
- J3:    unset: Input impedance is approx. 2000  $\Omega$  (for most TTL signals)  
       left position: Input terminated with 50  $\Omega$  impedance (for NIM signals)  
       right position: Input terminated with 520  $\Omega$  impedance (for fast TTL sources)

- J6:    Set (Closed): Output Width is approx. 35 ns  
       Unset (open): Output Width is approx. 10 ns

J2/J5: J2 is set, J5 in upper position:



J2/J5: J2 is unset, J5 in lower position:



Please note that the lower Lemo socket will **always** provide **NIM** signals.

- J4:    Set (Closed): when your TTL receiver has 50  $\Omega$  input impedance  
       Unset (open): your TTL receiver has high input impedance (k $\Omega$  range)

J1:    Top contacts are connected:



Set like this for NIM input signals

Bottom contacts are connected:

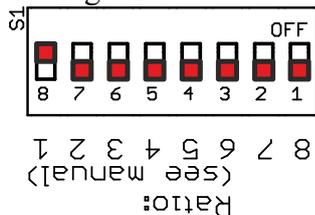


Set like this for TTL input signals

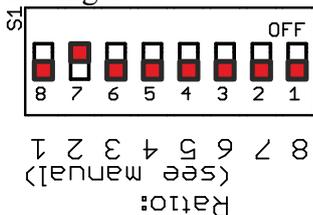
For setting the rate ratio, please refer to the next page.

The rate ratio can be set to any value between 1:2 and 1:256.

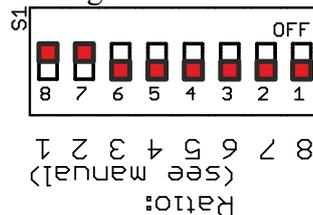
Setting 1:2:



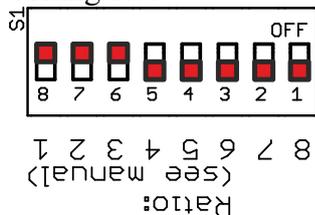
Setting 1:3:



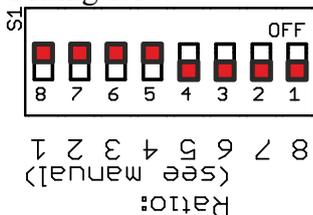
Setting 1:4:



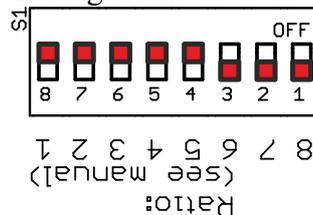
Setting 1:8:



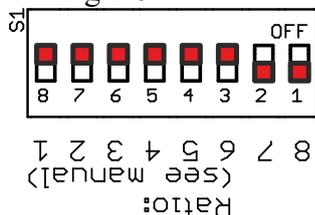
Setting 1:16:



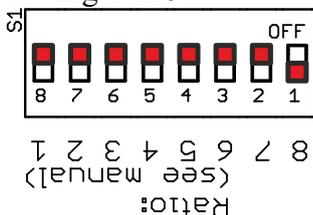
Setting 1:32:



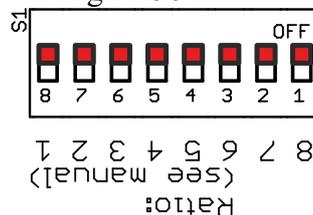
Setting 1:64:



Setting 1:128:

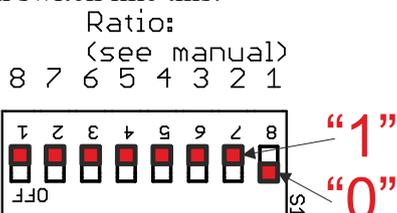


Setting 1:256:



### How to set different ratios, e.g. 1:50?

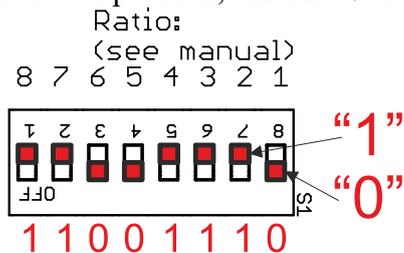
In order to set individual ratios, **the board should be rotated** so that you look onto the 8-position switch like this:



Now calculate the value of  $(256 - \text{desired ratio})$ , in this example  $256 - 50 = 206$ , and determine the binary expression of the result:

**$256 - 50 = 206$ , in binary: 11001110** (for a ratio of 1:50)

Now set the 8-position switch to this binary value. Please note that (in contrast to the word “off” which might be printed onto the switch) a “1” means that the corresponding switch must be in the lower position, and for “0” it must be in the upper position:



If your binary number is shorter than 8 digits, then add enough Zeros to the left in order to make it 8 digits:

**$256 - 200 = 56$ , in binary: 00111000** (for a ratio of 1:200)

And continue as described above.

The RDiv1 **will NOT work** when a ratio of 1:1 (all switches in the “1” position) is set!