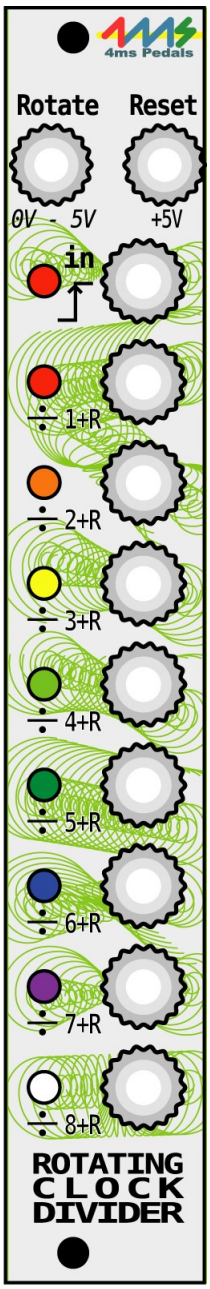


Rotating Clock Divider

Eurorack Module User Manual v1.0

PCB version 1.0

4ms Pedals

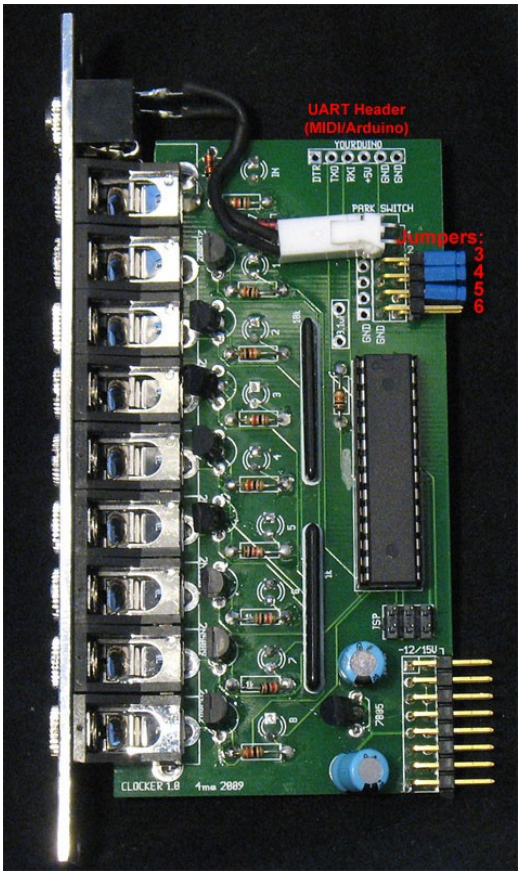
Features

- Divide-by-1 to Divide-by-64, on 8 output jacks
- CV Rotate jack to shift divide-by amount for each jack
- CV Reset to reset/re-sync all jacks
- Jumpers or optional break-out panel:
  - Select auto-reset (maximum 256 clocks)
  - Select maximum divide-by amount (8/16/32/64)
- UART header
  - Connects to Optional MIDI breakout panel
  - Arduino-compatible
- ISP header
  - Connects to in-circuit programmer such as AVR ISP MKII for reprogramming code
- Maximum input frequency 3kHz
- 4 H.P. Eurorack module
- 60mA typical power draw, 75mA max.

Jacks

- Clock Input (5V to 15V clock, rising edge triggered)
- CV Rotate (0V to +5V input)
- CV Reset (5V to 15V trigger)
- Divided Clock Outputs (8 jacks):
  - Divide-by (1+R)
  - Divide-by (2+R)
  - Divide-by (3+R)
  - Divide-by (4+R)
  - Divide-by (5+R)
  - Divide-by (6+R)
  - Divide-by (7+R)
  - Divide-by (8+R)

  ...where R is the CV Rotation (0 to 63)



Jumpers (PCB version 1.0)

There are four jumpers on the back, (labeled 3, 4, 5, and 6). Each can be set with a jumper plug, or an optional break-out panel with switches.

Jumpers 3 and 4: Max Divide-by Range

Jumpers		Divide-by range	Divide-by amount on jacks with no voltage applied to CV Rotate Jack (tables 2-5)
3	4		
in	in	1 to 8	1 to 8
in	no	1 to 16	9 to 16
no	in	1 to 32	17 to 24
no	no	1 to 64	33 to 40

Jumpers 5 and 6: Auto-reset

Jumpers		Auto-reset with Divide-by range of...			
5	6	1 to 8	1 to 16	1 to 32	1 to 64
in	in	32	64	128	256
in	no	16	32	64	128
no	in	24	48	96	192
no	no	none	none	none	none

Operation

Apply a clock signal to the Clock Input jack. Rising edges of 5V or greater will cause the internal dividing counters to be incremented. Each jack has its own counter and outputs a trigger pulse when its counter reaches the divide-by amount assigned to that jack. Typically, the outputs will patch to triggerable modules (drum modules, ADSR triggers, step sequencer clock input, etc..), but the RCD can operate in the audio frequency range, thus crudely stepping pitch downward.

Table 1: Clock outputs:

IN:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2		X		X		X		X		X		X		X		X		X		X		X		X		X		X		X		X
3			X			X			X			X			X			X			X			X			X			X		
4				X				X				X				X				X				X				X				X
5					X					X					X					X					X					X		
6						X						X						X						X						X		
7							X							X							X						X					
8								X								X								X								X
9									X									X									X					
10										X										X									X			
11											X											X										
...																																
32																																X

...etc, up to divide-by-64.

CV Rotation

By applying a CV signal to the CV Rotate jack, the clock divisions will rotate throughout the output jacks (*see table 2*). For example, if you apply just over 1.0V, Jack 1+R/Red will go from Divide-by-1 to Divide-by-2, and Jack 2+R/Orange will become Divide-by-3... up to Jack 8+R/White which will wrap ("rotate") around to become Divide-by-1. Applying more CV to the Rotate Jack will continue the rotation: next Jack 1 becomes Divide-by-3, then Divide-by-4, then Divide-by-5, until it's Divide-by-8 at the maximum input CV. Some non-linearities exist in the CV response, especially in the upper extreme.

CV Reset

Applying a CV of 5V or greater to the CV Reset jack will cause all the divide counters to reset. Counting will begin back at 1. Often a lower/slower output on the RCD is patched directly into the CV Reset jack.

Auto Reset

Jumpers 5 and 6 select the Auto-reset point, which causes the divide counters to reset after a certain number of clock pulses. Note that divide-by amounts which are evenly divisable by the reset amount are not affected: e.g. with an auto-reset of 16, divide-by outputs of 2, 4, 8, 16, etc are not changed.

Also, note that the CV Reset is independant of the Auto-reset. For example, Jack 7+R could be patched into the CV Reset with jumpers 3, 4, and 5 in. This would cause a reset every 7 clocks, plus an additional reset every 16 clocks.

There are too many combinations of Auto-reset and Max divide amounts to show all combinations!

Example: Auto-reset of 16 (Jumper 5 in, no Jumper 6), with Max Divide-by of 8 (Jumpers 3&4)

IN:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
3			X			X			X			X			X				X			X			X			X			X	
5					X					X					X						X					X					X	
7							X							X									X							X		

Rotation Tables

Table 2: Divide-by amounts at each jack, with max divide-by amount set to 8 (Jumper 3 in, Jumper 4 in):

Jacks	Voltage at CV Rotate Jack							
	<1.0 V	1.00V - 1.65V	1.65V - 2.30V	2.30V - 2.95V	2.95V-3.60V	3.60 V- 4.30 V	4.30V-5.10V	>5.1V
1+R/Red	1	2	3	4	5	6	7	8
2+R/Orange	2	3	4	5	6	7	8	1
3+R/Yellow	3	4	5	6	7	8	1	2
4+R/Lt Green	4	5	6	7	8	1	2	3
5+R/Green	5	6	7	8	1	2	3	4
6+R/Blue	6	7	8	1	2	3	4	5
7+R/Violet	7	8	1	2	3	4	5	6
8+R/White	8	1	2	3	4	5	6	7

Table 3: Divide-by amounts at each jack, with max divide-by amount set to 16 (Jumper 3 in, no Jumper 4):

Jacks	Voltage at CV Rotate Jack															
	< 0.67V	0.67V - 1.00V	1.00V - 1.33V	1.33V - 1.67V	1.67V - 2.00V	2.00V - 2.33V	2.33V - 2.67V	2.67V - 3.00V	3.00V - 3.33V	3.33V - 3.67V	3.67V - 4.00V	4.00V - 4.33V	4.33V - 4.67V	4.67V - 5.10V	5.10V - 5.80V	> 5.80V
1+R/Red	9	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8
2+R/Orange	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8	9
3+R/Yellow	11	12	13	14	15	16	1	2	3	4	5	6	7	8	9	10
4+R/Lt Green	12	13	14	15	16	1	2	3	4	5	6	7	8	9	10	11
5+R/Green	13	14	15	16	1	2	3	4	5	6	7	8	9	10	11	12
6+R/Blue	14	15	16	1	2	3	4	5	6	7	8	9	10	11	12	13
7+R/Violet	15	16	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8+R/White	16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Table 4: Divide-by amounts at each jack, with max divide-by amount set to 32 (no Jumper 3, Jumper 4 in):

Jacks	Voltage at CV Rotate Jack															
	<0.5 V	- 0.68V	- 0.86V	- 1.04V	- 1.22V	- 1.38V	- 1.54V	- 1.70V	- 1.86V	- 2.02V	- 2.18V	- 2.36V	- 2.52V	- 2.68V	- 2.82V	- 3.00V
1+R/Red	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
2+R/Orange	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	1
3+R/Yellow	19	20	21	22	23	24	25	26	27	28	29	30	31	32	1	2
4+R/Lt Green	20	21	22	23	24	25	26	27	28	29	30	31	32	1	2	3
5+R/Green	21	22	23	24	25	26	27	28	29	30	31	32	1	2	3	4
6+R/Blue	22	23	24	25	26	27	28	29	30	31	32	1	2	3	4	5
7+R/Violet	23	24	25	26	27	28	29	30	31	32	1	2	3	4	5	6
8+R/White	24	25	26	27	28	29	30	31	32	1	2	3	4	5	6	7

(con't)	- 3.18 V	- 3.34V	- 3.50V	- 3.68V	- 3.82V	- 4.00V	- 4.18V	- 4.36V	- 4.54V	- 4.72V	- 4.94V	- 5.17V	- 5.43V	- 5.80V	- 6.52V	> 6.52V
1+R/Red	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2+R/Orange	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
3+R/Yellow	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	1
4+R/Lt Green	19	20	21	22	23	24	25	26	27	28	29	30	31	32	1	2
5+R/Green	20	21	22	23	24	25	26	27	28	29	30	31	32	1	2	3
6+R/Blue	21	22	23	24	25	26	27	28	29	30	31	32	1	2	3	4
7+R/Violet	22	23	24	25	26	27	28	29	30	31	32	1	2	3	4	5
8+R/White	23	24	25	26	27	28	29	30	31	32	1	2	3	4	5	6

Table 5: Divide-by amounts at each jack, with max divide-by amount set to 64 (no Jumper 3, no Jumper 4):

Jacks	Voltage at CV Rotate Jack															
	<0.5 V	- 0.68V	- 0.86V	- 1.04V	- 1.22V	- 1.38V	- 1.54V	- 1.70V	- 1.86V	- 2.02V	- 2.18V	- 2.36V	- 2.52V	- 2.68V	- 2.82V	- 3.00V
1+R/Red	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
2+R/Orange	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
3+R/Yellow	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
4+R/Lt Green	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
5+R/Green	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
6+R/Blue	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
7+R/Violet	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
8+R/White	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55

(con't)	- 3.18V	- 3.34V	- 3.50V	- 3.68V	- 3.82V	- 4.00V	- 4.18V	- 4.36V	- 4.54V	- 4.72V	- 4.94V	- 5.17V	- 5.43V	- 5.80V	- 6.52V	> 6.52V
1+R/Red	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
2+R/Orange	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	1
3+R/Yellow	51	52	53	54	55	56	57	58	59	60	61	62	63	64	1	2
4+R/Lt Green	52	53	54	55	56	57	58	59	60	61	62	63	64	1	2	3
5+R/Green	53	54	55	56	57	58	59	60	61	62	63	64	1	2	3	4
6+R/Blue	54	55	56	57	58	59	60	61	62	63	64	1	2	3	4	5
7+R/Violet	55	56	57	58	59	60	61	62	63	64	1	2	3	4	5	6
8+R/White	56	57	58	59	60	61	62	63	64	1	2	3	4	5	6	7

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