Pulsar

Pulsar

absorb

gravity

burst

channel

− +   − +   − +

mode   absorb   rate/clk   burst   length

out 1   out 2   out 3   out 4   clock

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Description

Pulsar is a burst generator inspired by stars that output beams of electromagnetic radiation in space. Once keyed, a stream of triggers are dispersed across four outputs.

Environmental factors like absorb and gravity alter the behavior of each burst and affect its movement through time. Eight unique dispersion modes provide a range of stream types including Euclidean, binary, random, and fractal.
Galactic clocks for the Eurorack system.

- 14HP

- Burst generator

- Four unique outputs

- Eight dispersion modes

- Physics simulation with gravity and absorb

- Black anodized aluminum front panel

- Galactic Clocks

Table of Contents

Installation

To install, locate 14 HP of space in your Eurorack case and confirm the positive 12 volts and negative 12 volts sides of the power distribution lines. Plug the connector into the power distribution board of your case, keeping in mind that the red band corresponds to negative 12 volts. In most systems, the negative 12 volt supply line is at the bottom. The power cable should be connected to the Pulsar with the red band facing the bottom of the module.

Specifications

Format: 14 HP Eurorack module

Depth: 34mm (Skiff Friendly)

Max Current: +12V = 125mA
              -12V = 2mA

Pulsar

absorb

gravity

burst

channel

mode   absorb   rate/clk   burst   length

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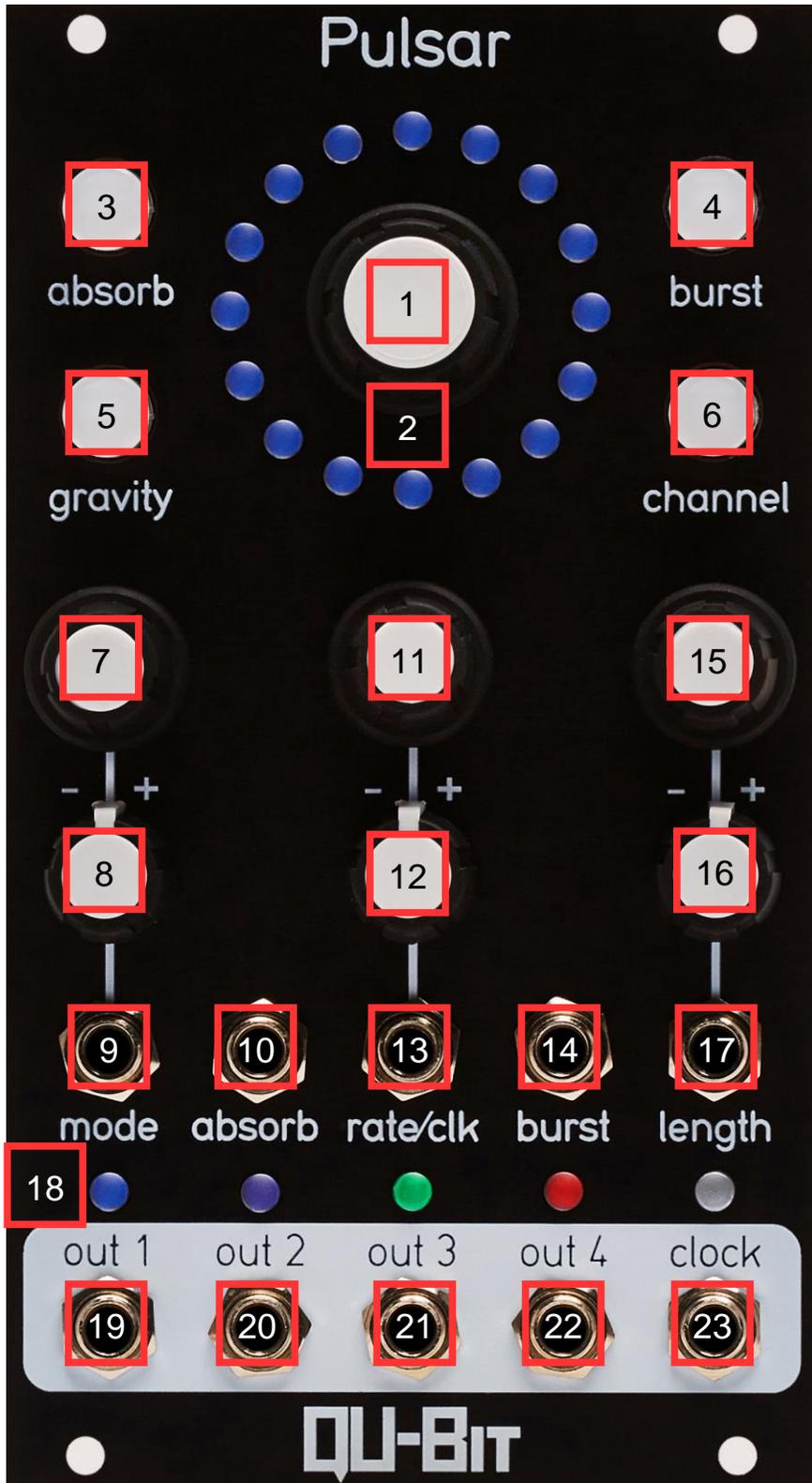
1. Master Encoder:
This encoder sets the pattern within the burst.
Pattern dispersion is based on the selected channel's currently selected mode and is indicated on the LED Ring.

Channel Page Operation:
Sequential Mode - Fine-tuning of a burst by manually setting each pulse on or off:
- Turning the Master Encoder will advance a cursor around the burst.
- Clicking the Master Encoder will toggle the currently selected pulse on or off.
- Clicking and turning the Master Encoder will rotate the burst clockwise and counter-clockwise.

Euclidean Mode - Algorithmic distribution of a number of pulses across the burst as evenly as possible, based on the currently selected Length:
- Turning the Master Encoder will set the number of pulses to evenly distribute across the LED Ring based on the currently selected Length.
- Clicking the Master Encoder will recalculate the pattern and reset its offset.
- Clicking and turning the Master Encoder will recalculate, and increment or decrement the offset of the Euclidean pattern.

Binary Mode - Burst creation from the binary representation of an unsigned 16-bit value (0-65535)
- Turning the Master Encoder will increase or decrease the current pattern represented as a binary value.
- Clicking the Master Encoder will toggle all pulses on (binary value of 65535) or off (binary value of 0).
- Clicking and turning the Master Encoder will bit-shift the burst left or right.

Random Mode - Generation of random bursts:
- Turning the Master Encoder will add or remove random pulses from the burst.
- Clicking the Master Encoder will seed a new random pattern for the burst with the currently set number of pulses.
- Clicking and turning the Master Encoder will rotate the burst clockwise and counter-clockwise.

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Global Page Operation:
- Turning the Master Encoder will affect each channel, relative to the mode each channel is set to.
- Clicking the Master Encoder will affect each channel, relative to the mode each channel is set to.
- When the Global Page is selected, pulses that are disabled on all 4 channels will be indicated by an unilluminated LED on the LED Ring.

(For more information on Pattern Distribution Modes, see **7. Mode Encoder**)

2. LED Ring:
The LED Ring shows visual feedback for all Channel Page and Global Page settings.

- Channel 1 settings and functionality are indicated in Blue.
- Channel 2 settings and functionality are indicated in Purple.
- Channel 3 settings and functionality are indicated in Green.
- Channel 4 settings and functionality are indicated in Red.
- All Global settings and functionality are indicated in White.

3. Absorb Button:
When pressed, the Absorb Button resets all bursts.

- If looping is disabled on a channel, the burst will not only reset, but will also stop advancing.
- If looping is enabled on a channel, the burst will reset, but will continue to advance on the next clock pulse.

The Absorb Button will illuminate when pressed or if a rising edge signal is present at the Absorb Input.

Muting Channels:
- When an individual Channel Page is selected, holding down the Channel Button while pressing the Absorb Button will mute the currently selected channel.
- When the Global Page is selected, holding down the Channel Button and then pressing the Absorb Button will mute and unmute all channels.
  - If any channels are muted, holding down the Channel Button and then pressing the Absorb Button will mute all unmuted channels.

Indication of muted channels can be seen by a dimly lit output indicator that illuminates in the color of the corresponding channel.

4. Burst Button:
When pressed, Burst will initiate all bursts.

- If a channel's burst is set to Asynchronous, the burst will output immediately.
- If a channel's burst is set to Synchronous, pulse 1 will output immediately, but the burst will advance on the next internal or external clock pulse.

Single Channel Burst:
When an individual Channel Page is selected, holding down the Channel Button while pressing Burst will exclusively trigger the corresponding channel's burst.

The Burst Button will illuminate when pressed or if a rising edge signal is present at the Burst Input.

5. Gravity Button:
Gravity is a time-based effect that, when enabled, will divide the burst's currently set rate by the maximum length of the burst. This generates a linear digression in time from the first pulse to the last pulse.

- If Gravity is enabled, the button will be illuminated.
- If Gravity is disabled, the button will not be illuminated.
- When the Global Page is selected, the Gravity button will illuminate if any channels have Gravity enabled.
- When Gravity is in this state, pressing the button will turn Gravity off for all other channels, otherwise, pressing the Gravity Button will toggle Gravity on and off for all channels.

6. Channel Button:
When pressed, the Channel Button will navigate sequentially through all four Channel Pages.

Holding the Channel Button down for 1 second or more will navigate to the Global Page.

It is important to note that the Channel Button also acts as a shift button for various functions.
(For more information on Shift functionality, see **3. Absorb Button**, **4. Burst Button**, **8. Mode Attenuverter**, **11. Rate/Clk Encoder**, **12. Rate/Clk Attenuverter**, and **16. Length Attenuverter**)

7. Mode Encoder:
This encoder sets the Pattern Distribution Mode and Output Dispersion Mode.

Channel Page Operation:
Modes are changed on a per channel basis.

Pattern Distribution Modes:
These define the manner in which burst patterns are generated or modified.

Turning the Encoder will set the Pattern Distribution Mode:
- Sequential - Fine-tuning of a burst by manually setting each pulse on or off.
    - Selection is indicated at the upper-left quadrant of the LED Ring.
- Euclidean - Algorithmic distribution of a number of pulses across the burst as evenly as possible, based on the currently selected Length.
    - Selection is indicated at the upper-right quadrant of the LED Ring.
- Binary - Burst creation from the binary representation of an unsigned 16-bit value (0-65535).
    - Selection is indicated at the lower-right quadrant of the LED Ring
- Random - Generation of random bursts.
    - Selection is indicated at the lower-left quadrant of the LED Ring

Global Page Operation:
All channels are set to the same mode.

Output Dispersion Modes:
These define the order in which all bursts are distributed across all 4 channels.

These modes are global settings affecting all channels, regardless of which page is selected.

Clicking the Encoder allows the user to set the Output Dispersion Mode:
- Simultaneous: All bursts output at the same time.
    - Selection is indicated by 4 colors blinking simultaneously at the upper-left quadrant of the LED Ring.
- Sequential Cascading: Complete bursts output from Channel 1 through Channel 4.
    - Selection is indicated by 4 colors blinking in sequential order at the upper-right quadrant of the LED Ring.
- Random Cascading: Complete bursts will output in a random order.
    - Selection is indicated by 4 colors blinking in random order at the lower-right quadrant of the LED Ring.
- Fractal: Outputs a random number of random bursts at the same time.
    - Selection is indicated by 4 colors blinking simultaneously and randomly at

the lower-left quadrant of the LED Ring.

8. Mode Attenuverter:
Attenuation and inversion of the control voltage present at the Mode Input

Holding Channel and moving the Mode Attenuverter within 1 second will set the Software Attenuverter.

- If the Channel Button is held down and the Mode Attenuverter is set fully clockwise, voltage will be full scale.
- If the Channel Button is held down and the Mode Attenuverter is set fully counter-clockwise, voltage will be fully inverted.

Channel Page Operation:
Mode Software Attenuverter is set on a per channel basis.

Global Page Operation:
All Mode Software Attenuverters are set the same.

9. Mode Input:
Control voltage input for the rotation of the burst.

Range: ±5V

- +5V will rotate all bursts one full clockwise rotation.
- -5V will rotate all bursts one full counter-clockwise rotation.

10. Absorb Input:
Gate input for Absorb.

11. Rate/Clk Encoder:
Encoder that sets the rate of all bursts.
The time between pulses can be set from 5ms to 16 seconds.

Channel Page Operation:
- Clicking the Rate/Clk Encoder will toggle the currently selected channel's burst from Asynchronous to Synchronous.
  - An Asynchronous burst will ignore the internal or external clock rate.
  - A Synchronous burst will be clocked to the internal or external clock rate.
    - Synchronous bursts are indicated by a white background on the corresponding output indicator
- Turning the Rate/Clk Encoder will change the rate of the currently selected burst.
  - If the burst is set to Asynchronous, rate will change smoothly.
  - If the burst is set to Synchronous, rate will be a multiplication/division of the master clock.
    - Indication of the multiplication/division value is seen on the LED Ring.
      - If the LED's advance clockwise, a multiplication factor corresponding to the number of illuminated LEDs is applied to the Synchronous burst.
      - If the LED's advance counter-clockwise, a divisor corresponding to the number of illuminated LEDs is applied to the Synchronous burst.

Global Page Operation:
- Clicking the Rate/Clk Encoder will toggle all channels' bursts from Asynchronous to Synchronous.
  - An Asynchronous burst will ignore the internal or external clock rate.
  - A Synchronous burst will be clocked to the internal or external clock rate.
    - Synchronous bursts are indicated by a white background on the corresponding output indicator
- Turning the Rate/Clk Encoder will change the rate of all Asynchronous bursts.
- Clicking and turning the Rate/Clk Encoder will change the multiplication/division value of all Synchronous bursts.
- When all channels are set to Synchronous, turning the Rate/Clk Encoder will change the multiplication/division value for all channels.
  - Indication of the multiplication or division value is seen on the LED Ring.
    - If the LED's advance clockwise, a multiplication factor corresponding to the number of illuminated LEDs is applied to the Synchronous bursts.
    - If the LED's advance counter-clockwise, a divisor corresponding to the number of illuminated LEDs is applied to the Synchronous bursts.

Setting Clock Rate:
Clock rate can be set from the Global Page or any Channel's Page.

- Pressing Channel while clicking the Rate/Clk Encoder will toggle the module between Internal Clock Mode and External Clock Mode.
- When internally clocked, pressing Channel while turning the Encoder will change the rate of the internal clock.
- When externally clocked, pressing Channel while turning the Encoder will change the multiplication/division value for the external clock.

Setting Pulse Width:
Pulse Width modes can be set from any Channel's Page.
Pulse Width Modes can also be set from the Global Page and will affect every channel.

- When a Channel Page is selected, holding down the Rate/Clk Encoder for 2 seconds will enter a menu for setting the pulse width of the corresponding channel.
  - Clicking the Rate/Clk Encoder when in this menu will toggle through three settings.
    - Fixed Mode will allow the user to manually set a discrete pulse width between 5ms and 500ms for all pulses.
      - This is indicated on the LED Ring. The LED Ring will advance as the Rate/Clk Encoder is moved.
    - 50% Pulse Width Mode will set all pulses to have a 50% Duty Cycle.
      - This is indicated on the LED Ring. The LED Ring will blink on the left and right side consecutively.
    - Random Pulse Width Mode will set each pulse to have a random pulse width.
      - This is indicated on the LED Ring as the LEDs illuminate randomly.
  - A selection is made immediately.
  - To exit, click and hold the Rate/Clk Encoder for 2 seconds or touch any other encoder.

12. Rate/Clk Attenuverter:
Attenuation and inversion of the control voltage present at the Rate/Clk Input when internally clocked. The Rate/Clk Attenuverter is inactive when externally clocked.

Holding the Channel Button and moving the Rate/Clk Attenuverter within 1 second will set the Software Attenuverter.

- If the Channel Button is held down and the Rate/Clk Attenuverter is set fully clockwise, positive voltage will add to the current setting.
- If the Channel Button is held down and the Rate/Clk Attenuverter is set fully counter-clockwise, positive voltage will subtract from the current setting.

Channel Page Operation:
Rate/Clk Software Attenuverter is set on a per channel basis.

Global Page Operation:
All Rate/Clk Software Attenuverters are set the same.

13. Rate/Clk Input:
External clock input when set to External Clock Mode.
Control voltage input for rate of Asynchronous bursts and multiplication/division value of Synchronous bursts when set to Internal Clock Mode.

Range: ±5V

14: Burst Input:
Gate input for Burst.

15. Length Encoder:
This encoder sets the length of all bursts.

Channel Mode Operation:
- Turning the Length Encoder will set the length of the currently selected burst.
  - Length can be set from -16 pulses to +16 pulses.
    - If a positive value is selected, the burst will advance clockwise.
      - This is indicated by a clockwise LED advancement from beginning of the burst on the LED Ring.
    - If a negative value is selected, the burst will advance counter-clockwise.
      - This is indicated by a counter-clockwise LED advancement from beginning of the burst on the LED Ring.
    - Length is indicated by the corresponding number of illuminated LEDs within the LED Ring.
- Clicking the Length Encoder will toggle Looping Mode for the currently selected channel.
- Clicking and turning the Length Encoder will set the number of repeats for the currently selected burst.
  - If the number of repeats is set to 1, the burst will output 1 time.
  - If the number of repeats is set to 16, the burst will output 16 times.
  - Number of repeats can be set from 1 to 16.
    - Number of repeats is indicated by the corresponding number of blinking LEDs within the LED ring.

Global Mode Operation:
- Turning the Length Encoder will set the length of all bursts.
  - Length can be set from -16 pulses to +16 pulses.
    - If a positive value is selected, the bursts will advance clockwise.
      - This is indicated by a clockwise LED advancement from beginning of the burst on the LED Ring.
    - If a negative value is selected, the bursts will advance counter-clockwise.
      - This is indicated by a counter-clockwise LED advancement from beginning of the burst on the LED Ring.
    - Each channel's Length value updates relatively to it's currently set value and will clip at -16 or +16.
    - Length is indicated by the corresponding number of illuminated LEDs within the LED Ring.
- Clicking the Length Encoder will toggle Looping Mode for all channels.
  - If any channels are looping, clicking the Length Encoder will disable looping on all channels.
- Clicking and turning the Length Encoder will set the number of repeats for all bursts
  - Number of repeats can be set from 1 to 16.
    - Each channel's repeats value will clip at -16 or +16.

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- Number of repeats is indicated by the corresponding number of blinking LEDs within the LED ring.

16: Length Attenuverter:
Attenuation and inversion of the control voltage present at the Length Input.

Holding Channel and moving the Length Attenuverter within 1 second will set the Software Attenuverter.

- If the Channel Button is held down and the Length Attenuverter is set fully clockwise, positive voltage will add to the current setting.
- If the Channel Button is held down and the Length Attenuverter is set fully counter-clockwise, positive voltage will subtract from current setting.

Channel Page Operation:
Length Software Attenuverter is set on a per channel basis.

Global Page Operation:
All Length Software Attenuverters are set the same.

17: Length Input:
Control voltage input for Length.

Range: ±5V.

- If your Length is set to -16. +5V will set it to +16.
- If your Length is set to +16, -5V will set it to -16.

18: Output Indicators:
LED indicators for each pulse Output.

- Channel 1 is indicated in Blue.
- Channel 2 is indicated in Purple.
- Channel 3 is indicated in Green.
- Channel 4 is indicated in Red.
- The clock is indicated in White.

Channel 1, 2, 3, and 4
- A colored pulse indicates the burst.
- An unilluminated background indicates an Asynchronous channel.
- A white illuminated background indicates a Synchronous channel.
- A dimly colored background indicates a muted channel.

Clock Output
- Indicates the rate of the internal or external clock.
- If set to External Clock mode, but no voltage is present at the Rate/Clk Input, the LED will not be illuminated.

19. Channel 1 Output:
Burst output for Channel 1.

20: Channel 2 Output:
Burst output for Channel 2.

21. Channel 3 Output:
Burst output for Channel 3.

22. Channel 4 Output:
Burst output for Channel 4.

23. Clock Output:
Output of internal clock or multiplied/divided external clock.

Software Attenuverters:
- These are secondary attenuverter stages that occur digitally after the hardware attenuverter stage. They allow the user to modify incoming CV on a per channel basis.
- By default or after a Reset, they are set to full scale (bypassed)
- This can be set by pressing the Channel Button and changing the position of any attenuverter.
- After releasing the Channel Button, the position of the attenuverter is, once again, affecting all channels.
- Setting software attenuverters from the Global Page will affect on channels.

Saving Settings:
- All settings are written to non-volatile memory and will save in between power cycles except for each channel's Pulse Width setting and each channel's Software Attenuverters
- Settings will save when any encoder is clicked or when the Gravity or Channel Buttons are pressed.

Reset:
- To reset a specific channel to the default settings, hold down the Channel Button and the Gravity Button from the corresponding Channel's Page for 1 second.
- A Channel Reset will be indicated by two illuminated LEDs that advance from top to bottom in the color of the corresponding channel on both sides of the LED Ring.
- To reset all channels to the default settings, hold down the Channel Button and the Gravity Button for 1 second when the Global Page is selected.
- A Global Reset will be indicated by two white LEDs that advance from top to bottom on both sides of the LED Ring.