



# electro-harmonix MAINFRAME Bit Crusher Pedal Instructions

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electro-harmonix

**electro-harmonix MAINFRAME Bit Crusher Pedal**



## Product Information

Congratulations on your purchase of the MAINFRAME! The MAINFRAME is a powerful and easy-to-use sample rate reducer and bit crusher that allows you to introduce old-school digital audio sounds into your music. With a broad range of controls, you can fine-tune the digital artifacts to your liking. The innovative Sample Rate Tuning Mode makes it easy to match the sample reduction to a pitch, even on the fly. Immerse your tone in the sounds of the arcades, consoles, and terminals of yesteryear with the MAINFRAME.

**WARNING:** Your Mainframe comes equipped with an Electro-Harmonix 9.6DC-200BI power supply. The Mainframe requires 90mA at 9VDC with a center negative plug. Please ensure that you use the correct adapter and plug polarity to avoid damaging your Mainframe and voiding the warranty. The power plug should not exceed 10.5VDC.

Power supplies rated for less than 90mA may cause the Mainframe to act unreliably.

## Features

- Sample Rate Reduction ranging from 48kHz to 110Hz
- Bit Depth Reduction ranging from 24-bit to 1-bit
- Selectable High/Low/Band-Pass filter to shape the artifacts of the bit crushing and sample rate reduction
- Sample Rate Tuning Mode allows you to set the sample rate to match the key of a song or adjust it based on what you play on your instrument
- Programmable preset or expression pedal setting for saving your sound or controlling any combination of the Mainframe's knobs with an external expression pedal
- Secondary knob parameters for fine-tuning the Mainframe's effect
- High-quality buffered bypass and silent switching

## Specifications:

- **Audio input impedance:** 2M
- **Audio output impedance the OUTPUT jack:** 500
- **Current draw:** 90mA
- **Maximum input signal level:** 6.25 dBu (4.5V peak-to-peak)

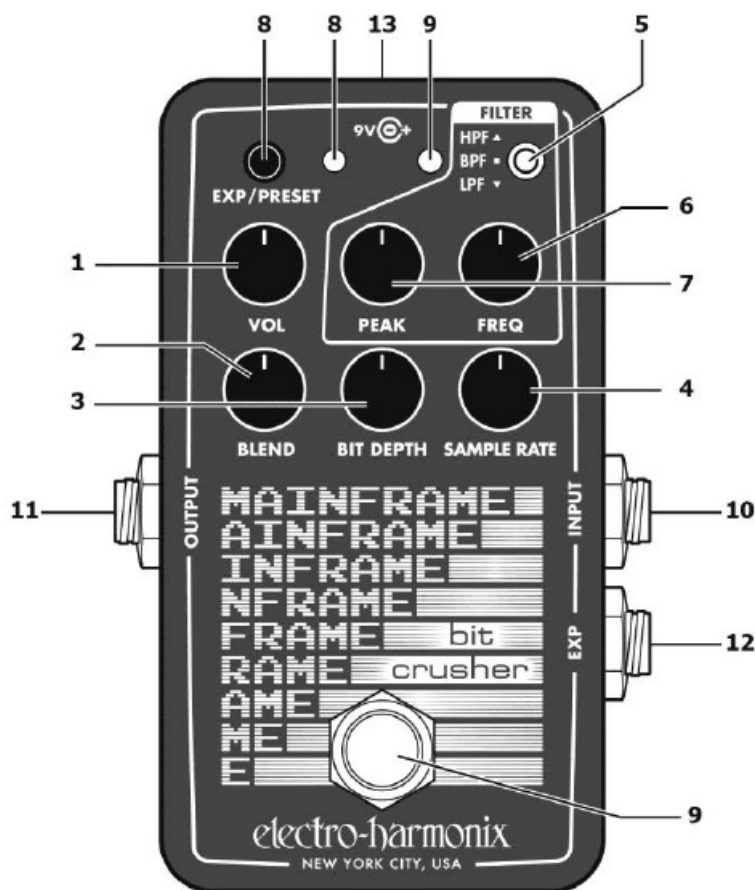
## Product Usage Instructions

1. **VOL Knob:** Set the master output level of the Mainframe using this knob.
2. **BLEND Knob:** Blend between the dry guitar signal and the effect signal. Turn the knob clockwise to range from completely dry guitar to a fully affected signal with the filter applied.
3. **BIT DEPTH Knob:** Reduce the bit depth of the signal by turning this knob clockwise. This produces a distorted, noisy tone.
4. **SAMPLE RATE Knob:** Reduce the sample rate of the signal by turning this knob clockwise. This produces a ringing or glitchy tone.
5. **FILTER HPF/BPF/LPF Switch:** This toggle switch controls the direction of the Mainframe's filter:
  - **HPF:** High-Pass Filter
  - **BPF:** Band-Pass Filter
  - **LPF:** Low-Pass Filter
  - **HPF:** Frequencies above the FREQ knob setting are passed, frequencies below are cut.
  - **BPF:** The FREQ knob controls the center frequency of a pass band. Frequencies above and below this center frequency are cut.
  - **LPF:** Frequencies below the FREQ knob setting are passed, frequencies above are cut.
6. **FILTER FREQ Knob:** Control the frequency of the Mainframe's filter. As you turn the knob up, the frequency increases. The frequencies cut/passed by the filter vary based on the filter type:  
**Tip:** For a tone with no filtering, set the FREQ knob to maximum and set the toggle switch to LPF.
7. **FILTER PEAK Knob:** Control the resonance of the Mainframe's filter. Turning this knob clockwise increases the resonance, producing a sharper, more cutting tone.

Congratulations on your purchase of the MAINFRAME, a powerful but easy-to-use sample rate reducer and bit crusher. Introducing old-school digital audio sounds into your music has never been easier. A broad range of controls help you fine-tune the digital artifacts, and the innovative Sample Rate Tuning Mode makes it easy to match the sample reduction to a pitch, even on the fly. Access the MAINFRAME and immerse your tone in the sounds of the arcades, consoles, and terminals of yesteryear.

**WARNING:** Your Mainframe comes equipped with an Electro-Harmonix 9.6DC-200BI power supply. The Mainframe requires 90mA at 9VDC with a center negative plug. Use of the wrong adapter or a plug with the wrong polarity may damage your Mainframe and void the warranty. Do not exceed 10.5VDC on the power plug. Power supplies rated for less than 90mA will cause the Mainframe to act unreliably.

## CONTROLS AND CONNECTIONS



1. VOL Knob This knob sets the master output level of the Mainframe.
2. BLEND Knob This knob blends between the dry guitar signal and the effect signal. As the knob is turned clockwise, the output ranges from completely dry guitar to a fully effected signal with the filter applied.
3. BIT DEPTH Knob As this knob is turned clockwise, the bit depth of the signal is reduced, producing a distorted, noisy tone.
4. SAMPLE RATE Knob As this knob is turned clockwise, the sample rate of the signal is reduced, producing a ringing or glitchy tone.
5. **FILTER HPF/BPF/LPF Switch** This toggle switch controls the direction of the Mainframe's filter:
  - **HPF:** High-Pass Filter
  - **BPF:** Band-Pass Filter
  - **LPF:** Low-Pass Filter
6. FILTER FREQ This knob controls the frequency of the Mainframe's filter. As the knob is turned up, the frequency increases.

**The frequencies cut/passed by the filter vary by the filter type:**

- **HPF:** Frequencies above the FREQ knob setting are passed, frequencies below are cut.
  - **BPF:** The FREQ knob controls the center frequency of a pass band. Frequencies above and below this center frequency are cut.
  - **LPF:** Frequencies below the FREQ knob setting are passed, frequencies above are cut.
- Tip:** For a tone with no filtering, set the FREQ knob to maximum and set the toggle switch to LPF.
7. FILTER PEAK This knob controls the resonance of the Mainframe's filter. Turning this knob clockwise increases the resonance, producing a sharper, more cutting tone.
  8. EXP / PRESET Button and Green LED This button turns expression mode or a saved preset on and off. When the Green LED is lit, expression control is enabled, or the preset is enabled. See pages 6-9 for details on how to save expression settings or a preset.

9. Footswitch and Red LED Press and release the footswitch to toggle between bypass and effect modes. When the red LED is lit, the Mainframe is in effect mode. Double tap the footswitch to enter Sample Rate Tuning Mode, and tap it once again to exit Sample Rate Tuning Mode and save the tuned sample rate.
10. INPUT Jack This 1/4" phone jack is the audio input of the Mainframe. The input impedance is 2M  $\Omega$ .
11. OUTPUT Jack This 1/4" phone jack is the main audio output of the Mainframe. The output impedance is 500  $\Omega$ .
12. EXP Jack Connect an expression pedal or control voltage jack to allow for external control over every knob on the Mainframe. See pages 6-9 for a description on how to set up and control the Mainframe with an external expression pedal.
13. 9V Power Jack Plug the output of the Mainframe's supplied EHX9.6DC 200mA AC adapter to the 9V power jack located at the top of the pedal. The Mainframe requires 90mA at 9VDC with a center-negative plug. Do not exceed 10.5VDC on the power jack.

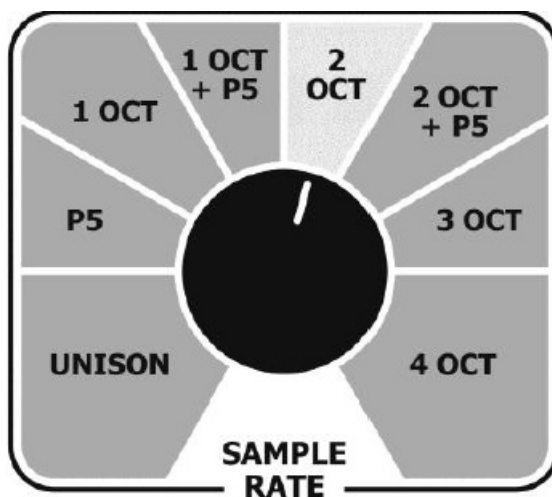
## SAMPLE RATE TUNING MODE

In Sample Rate Tuning Mode, the Mainframe analyzes your input signal in real-time, and sets the sample rate to match the pitch of your signal, or a set interval above your signal. You can use this mode to lock the sample rate to a certain pitch for a song, or you can keep it constantly tuning along with every note you play.

### HOW TO TUNE THE SAMPLE RATE

1. Double-tap the footswitch to enter Sample Rate Tuning Mode. The Red LED will begin blinking in a slow pattern to indicate that the Mainframe is actively tuning the signal.  
**Note:** You can leave the Mainframe in tuning mode indefinitely and it will continually tune to your signal.
2. While in Sample Rate Tuning Mode, turn the SAMPLE RATE knob to select the interval above the guitar pitch at which the sample rate will be set. See the diagram below for the available interval ranges. The default interval is two octaves.
3. While in Sample Rate Tuning Mode, tap the footswitch again to lock the sample rate to whatever note you're currently playing. You must be playing a note while pressing this footswitch for the Mainframe to save the note/interval combination.

### INTERVAL RANGES IN SAMPLE RATE TUNING MODE



While in Sample Rate Tuning Mode, the Mainframe reads the input signal, then multiplies it by the interval selected with the SAMPLE RATE knob (see diagram) to produce the tuned sample rate of your choice.

**Example:** If the interval is set to 2 octaves and the guitar plays an A2 (110Hz), the sample rate will be set to A4 (440Hz).

**Tip:** When the interval is set to Unison or Octave, you may hear little to no sound while in Sample Rate Tuning mode, because the Mainframe is sampling the signal in the same place every cycle.

## **PRESERVING OR DISCARDING THE TUNED SAMPLE RATE**

- Once locked, the tuned sample rate will be maintained even if the pedal is powered off and on.
- To discard the tuned sample rate, turn the SAMPLE RATE knob, or re-enter Sample Rate Tuning Mode by double-tapping the footswitch.
- The interval range set by sample rate tuning mode is also saved until the SAMPLE RATE knob is turned again in Sample Rate Tuning Mode.

## **WHEN USING AN EXPRESSION SETTING OR A PRESET**

If a custom expression setting (see pages 6-9) has been set up to control the sample rate of the Mainframe, Sample Rate Tuning Mode will be unavailable while expression is active. If a preset is currently active, turning on Sample Rate Tuning Mode will flag that the preset has been altered (see page 8). If you are currently in Sample Rate Tuning Mode while such an expression setting or preset is loaded, the Mainframe will exit Sample Rate Tuning Mode and the expression pedal or preset will control the sample rate. When using the factory default expression setting, the expression pedal will sweep from no sample rate reduction up to the sample rate set by Sample Rate Tuning Mode. Sample Rate Tuning Mode can be used while creating an expression pedal setting or preset, either by starting the preset/expression procedure while Sample Rate Tuning Mode is active, or by turning on Sample Rate Tuning Mode while creating the expression setting or preset.

## **PRESET AND EXPRESSION PEDAL USE**

The Mainframe can store one custom setting in memory. This custom setting can function as a preset with a snapshot of the toggle switch and each knob position, or as a custom expression pedal setting allowing you to sweep any combination of knobs between two saved positions in any direction. Press the EXP/PRESET button to activate the saved setting.

If no custom setting has been made, by factory default an expression pedal plugged into the EXP jack will control the sample rate of the Mainframe. At the heel position, the sample rate will be the full 48kHz. At the toe position, the sample rate will match the sample rate set by SAMPLE RATE knob or by Sample Rate Tuning Mode. There is no factory default preset, so if no expression pedal is used, pressing the EXP/PRESET button will not load any different sound. When making a custom setting, the heel and toe positions are saved for an expression setting, and the toe position is also saved as a preset that can be recalled without an expression pedal. The toggle switch position is also saved and can be recalled as a preset or with an expression pedal.

## **CREATING A CUSTOM PRESET**

1. Press and hold the EXP/PRESET button until the green LED starts blinking slowly.
2. Press and release the EXP/PRESET button again. The green LED starts blinking rapidly.
3. Turn any of the knobs and the FILTER switch to the settings you would like to use for the preset. If the controls are already in the position you would like for the preset, there is no need to turn anything.
4. Press and release the EXP/PRESET button. The green LED will light solid, indicating that the preset is active. If Sample Rate Tuning Mode was active during the creation, it will be turned off and the tuned sample rate will be saved to the preset.

## **CREATING A CUSTOM EXPRESSION SETTING**

1. Press and hold the EXP/PRESET button until the green LED starts blinking slowly. This is heel-acquisition mode for an expression setting.
2. Turn any of the knobs to the settings you would like to use for the heel position of the expression pedal.
3. Press and release the EXP / PRESET button. The green LED will start blinking quickly, indicating that the heel expression settings have been saved and the Mainframe has entered toe-acquisition mode.
4. Turn any of the knobs to the settings you would like to use for the toe position of the expression pedal. Set the FILTER toggle switch to the position you would like to use for the expression setting.  
**Note:** Any knobs that are in the same position in the heel- and toe-acquisition modes will not be included in the expression setting, but their toe position will still be used when loading a preset without an expression pedal.
5. If you have an expression pedal plugged in to the Mainframe, you can sweep the pedal during toe-acquisition to hear how the expression settings will sound.
6. Press and release the EXP/PRESET button. The green LED will light solid, indicating that the expression setting or preset is active. If Sample Rate Tuning Mode was active during the creation, it will be turned off and the tuned sample rate will be saved to the toe position of the expression setting.

**Tip:** You can follow the above instructions to create an expression setting even if an expression pedal is not plugged in. For this reason, the heel- and toe-acquisition settings are always part of the process, whether you're creating an expression setting or a preset.

### **CANCELING PRESET OR EXPRESSION SETTING CREATION**

While creating a preset or in the heel- or toe-acquisition modes, you can cancel the creation of a custom expression setting or preset by pressing and releasing the footswitch. The previously-saved expression setting or preset will be loaded, and any new settings will be discarded.

### **RECALLING / UNLOADING A PRESET OR EXPRESSION SETTING**

1. Press and release the EXP / PRESET button. The green LED will light, and the Mainframe will load your saved expression setting or preset.
2. If an expression pedal is present, any knobs that are saved to the expression setting are disabled and the expression pedal controls those parameters. If no expression pedal is present, the Mainframe loads the saved positions of all knobs. In both situations, the FILTER toggle switch's saved setting will be loaded.
3. To unload the setting or preset, press and release the EXP / PRESET button. The green LED will turn off, and the toggle switch and any knobs that were part of the expression pedal setting or preset will return to What You See Is What You Get operation.

### **CHANGING PARAMETERS AFTER RECALL**

Normally, the green LED lights solid after loading an expression setting or preset. If the FILTER toggle switch is moved, or if a knob is moved while a preset is loaded (with no expression pedal connected), the green LED will blink very rapidly to indicate that the preset has been loaded but has been altered.

### **RELOADING ALTERED EXPRESSION SETTINGS OR PRESETS**

In the situation where an expression setting or preset has been altered and the green LED is blinking, press and release the EXP/PRESET button to recall the saved setting again.

### **SAVING ALTERED EXPRESSION SETTINGS OR PRESETS**

If you would like to save an altered expression setting or preset, press and hold the EXP/PRESET button for 1 second. The green LED will light solid, then blink quickly once the new preset has been saved.

## ERASING THE CUSTOM EXPRESSION SETTING OR PRESET

Press and hold the EXP / PRESET button. While holding it, press and release the footswitch. The green LED will blink quickly, then light solid, indicating that the Mainframe has loaded the factory default expression setting and the custom expression setting or preset has been erased.

## POWERING UP WITH A SAVED PRESET OR EXPRESSION SETTING

If power is removed from the Mainframe while a preset or expression setting is active, it will be active when the Mainframe is powered up again, regardless of knob and toggle switch position.

**Note:** If there are alterations that haven't been saved when power is removed from the Mainframe, the changes will be lost and the saved version of the preset or expression setting will be loaded.

## EXPRESSION PEDAL SPECIFICATIONS AND COMPATIBILITY

The Mainframe accepts an expression pedal with TRS plug or control voltage (CV) on a TS plug at its EXP phone jack. The polarity of the expression pedal's plug must have the Sleeve connected to the heel position (usually GND), Ring connected to the toe position and the Tip connected to the wiper. The nominal expression pedal impedance is 10k $\Omega$  though most other values will work fine. Please do not go below 6k $\Omega$  on your expression pedal's potentiometer impedance. Some suggested Expression Pedals: EHX Expression Pedal, M-Audio® EX-P, Moog® EP-2 and EP-3, Roland® EV-5 or Boss® FV-500L. Additionally, the EXP IN jack can be connected to a CV source using a TS plug; the acceptable control voltage range is 0V to 5V.

## SECONDARY KNOB FUNCTIONALITY

The Mainframe allows you to take even more control over the bit crushing effects by accessing "hidden" parameters through Secondary Knob Mode. Use the secondary knob functions to fine tune the exact tone you want from the Mainframe.

## USING SECONDARY KNOB MODE

1. Press and hold the footswitch. While holding the footswitch, press the EXP/PRESET button. The Red LED will blink to indicate that you are in Secondary Knob Mode.
2. Turn the PEAK, FREQ, BIT DEPTH, and SAMPLE RATE knobs to edit the secondary knob parameters. The VOL and BLEND knobs work normally in Secondary Knob Mode.
3. To exit Secondary Knob Mode, press and release the footswitch or the EXP/PRESET button. The Red LED will stop blinking. The secondary knob parameters are saved and will be maintained even if the Mainframe is power cycled.

**Note:** The normal knob parameters set by the PEAK, FREQ, BIT DEPTH, and SAMPLE RATE knobs before entering Secondary Knob Mode are preserved until those knobs are moved again.

## SECONDARY KNOB PARAMETERS

**SAMPLE RATE Knob:** Toggle continuous/pitched sample rates When set below 50% (factory default), the Mainframe's sample rate reduction can be adjusted continuously through its range.

When set above 50%, the sample rate is constrained to musical pitches, and is adjusted one half-step at a time.

**BIT DEPTH Knob:** Toggle envelope-following/fixed bit crushing When set below 50% (factory default), the Mainframe's bit crushing follows the instrument's amplitude envelope. In this setting, loud and soft signals will have the same number of bits. When set above 50%, the Mainframe's bit depths have fixed levels, so quiet signals have fewer bits, and are therefore more distorted. This also results in a gating effect at higher settings.

**FILTER FREQ Knob:** Toggle 2nd-order/4th-order filter When set below 50% (factory default), the filter will be 2nd-order. When set above 50%, the filter will be 4th-order. This setting applies to all filter directions (LPF, BPF, HPF). The 4th-order filter more strongly blocks any frequencies that are being cut by the filter.

**FILTER PEAK Knob:** Input gain

Controls the input gain of the Mainframe. As this knob is turned clockwise, the gain increases, producing a hard-clipping distortion. Factory default is with this knob fully counter-clockwise.



## ERASING SECONDARY KNOB SETTINGS

To erase all secondary knob settings and restore them to factory defaults, first unplug the Mainframe from power. Press and hold the footswitch. Then, while holding the footswitch, plug power back in to the Mainframe. The Red LED will blink quickly, indicating that all secondary knob functions have been restored to the factory default.

## TIPS AND TRICKS

- **Why adjust the sample rate in a bit crusher?**

Using the Mainframe's sample rate reduction will provide the most immediate "glitchy old-school computer" sounds, even though it's not reducing the signal's bit depth ("bit-crushing").

- **What are good ways to use the filter?**

Sample rate and bit depth reduction create artifacts in the audio signal that are mostly apparent as high-frequency aliasing noises or distortion. Using the Mainframe's switchable Low Pass / Band Pass /or High Pass filter, these noises can be made more subtle, or strengthened to emphasize the digital effect.

- **LPF** – Use this to reduce high frequencies. Older digital systems used low-pass filters to eliminate unwanted noises, so this can be used to mimic the lo-fi "gritty" sound of old digital equipment.
- **HPF** – This reduces low frequencies. This can be used to emphasize the Mainframe's digital noises, and can also be used to mimic the weak bass response of small low-cost digital devices (like toys, handheld games, etc.).
- **BPF** – This is the previous two filters combined, providing some of the benefits of each. This can also be used for a wah-like sound when using an expression pedal, or a cocked-wah sound without an expression pedal.

- **Where should this go in the signal chain?**

Like nearly any pedal, there is no "right" place to put the Mainframe in a signal chain, so feel free to experiment with different placements. As a starting point, it can help to treat the Mainframe as a distortion pedal, and it can "stack" well before or after other distortion, drive, or fuzz pedals.

## WARRANTY INFORMATION

Please register online at <http://www.ehx.com/product-registration> or complete and return the enclosed warranty card within 10 days of purchase. Electro-Harmonix will repair or replace, at its discretion, a product that fails to operate due to defects in materials or workmanship for a period of one year from date of purchase. This applies only to original purchasers who have bought their product from an authorized Electro-Harmonix retailer. Repaired or replaced units will then be warranted for the unexpired portion of the original warranty term. If you should need to return your unit for service within the warranty period, please contact the appropriate office listed below. Customers outside the regions listed below, please contact EHX Customer Service for information on warranty repairs at [info@ehx.com](mailto:info@ehx.com) or +1-718-937-8300. USA and Canadian customers: please obtain a Return Authorization Number (RA#) from EHX Customer Service before returning your product. Include- with your returned unit- a written description of the problem as well as your name, address, telephone number, e-mail address, RA# and a copy of your receipt clearly showing the purchase date.

### United States and Canada

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To hear demos on all EHX pedals visit us on the web at [www.ehx.com](http://www.ehx.com) Email us at [info@ehx.com](mailto:info@ehx.com)

## COMPLIANCE


**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.




Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

-  The CE logo indicates that this product has been tested and shown to conform with all applicable European Conformity directives.

## Documents / Resources

	<a href="#">electro-harmonix MAINFRAME Bit Crusher Pedal</a> [pdf] Instructions MAINFRAME, MAINFRAME Bit Crusher Pedal, Bit Crusher Pedal, Crusher Pedal, Pedal
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## References

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