



HOTHAND™

Motion Controlled Phaser/Flanger
Users Guide

Please Read This First

Important Safety Information

- **WARNING!** Before using unit, be sure to read the owners manual and other warnings below.
- **CAUTION!** All electronic devices should be out of reach of children.
- **CAUTION!** If used improperly, batteries may explode or leak and cause damage or injury.

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Welcome!

Thank you for purchasing The Hot Hand™ Motion Controlled Phaser/Flanger. We hope to help you discover a whole new world of musical expression.

Hot Hand products may be completely new, but they are easy to use. We have worked hard to bring you as much power and as many features as possible while keeping the controls simple and intuitive.

This manual is organized so that you can get started quickly. Read over the first few pages and you will be ready to go. If you would like to know more about the product, move on to the following sections. It is certainly recommended that you quickly read the section on the Hot Hand on page 13. A few quick insights into how it works will allow you better control of the sounds you create.

Enjoy!

—The Source Audio team

Overview of Features

MOTION CONTROL

Motion control with Hot Hand™, which uses patent-pending technology to translate your body movement into sound.

INTUITIVE

An innovative and simple interface that makes it easy to access all features.

MODERN DESIGN

A thoughtfully designed box, which features rugged construction and sleek design.

DIVERSE SOUND PALETTE

A wide palette of sounds: some new, some classics, and all customizable.

STATE-OF-THE-ART DSP

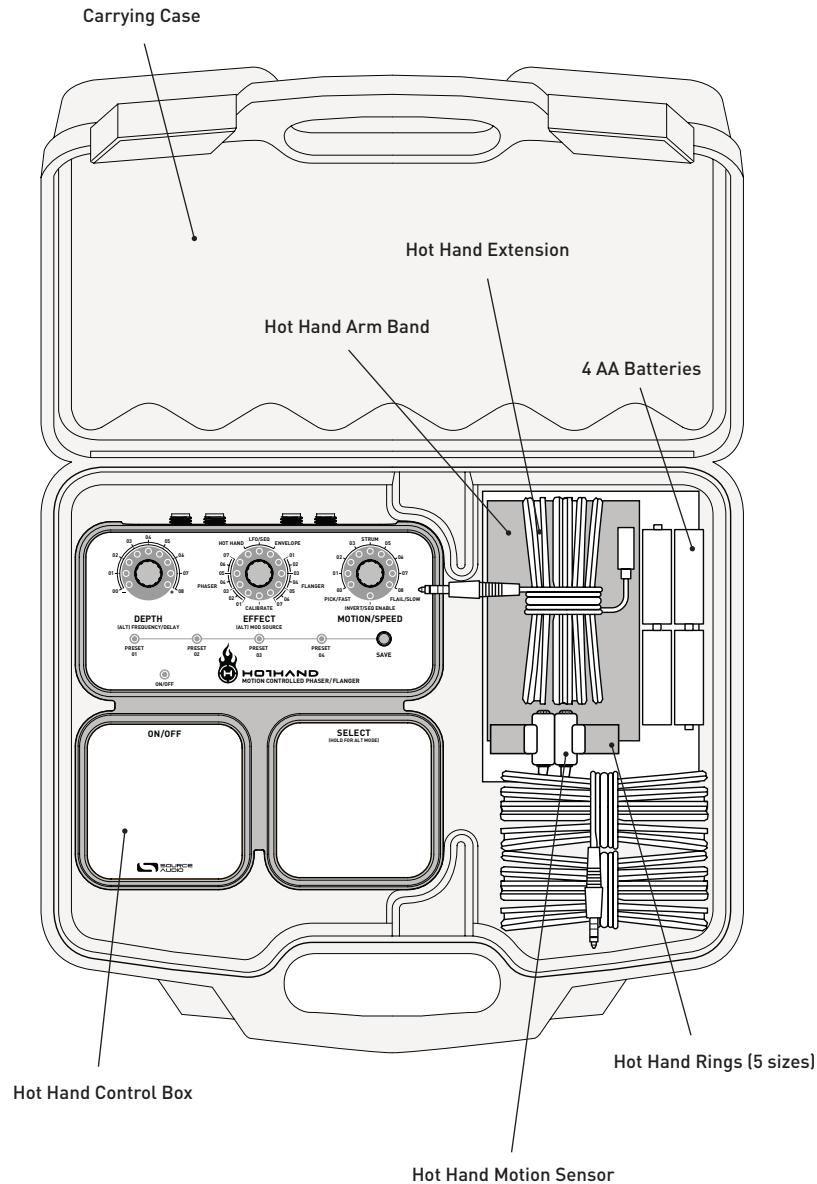
Our proprietary state-of-the-art 56 bit Digital Signal Processing chip, the SA601, and crystal clear 24 bit converters.

ULTRA-CLEAN SIGNAL

“Active Analog Bypass” which routes the signal around the entire signal processing path to ensure your signal is clean when the effect is not engaged.

Quick Start

Your Hot Hand comes with the following components.

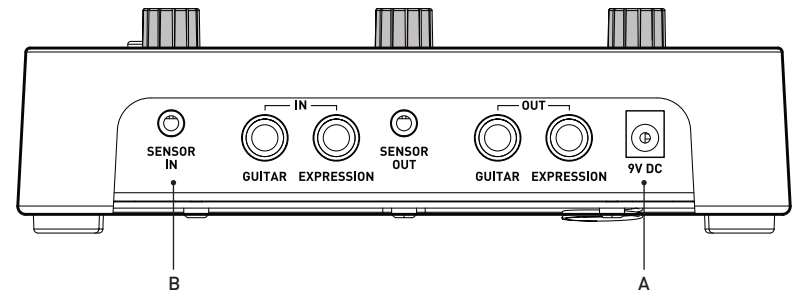


01 : Power

The first thing you will need is power. Your Hot Hand™ unit comes with 4 AA batteries to get you started. The batteries will typically last about 15 to 20 hours. To avoid concerns about battery life, we recommend you buy a Source Audio 9V DC power supply (A) [see power supply note on page 14 for exact requirements].

02 : SENSOR IN connection

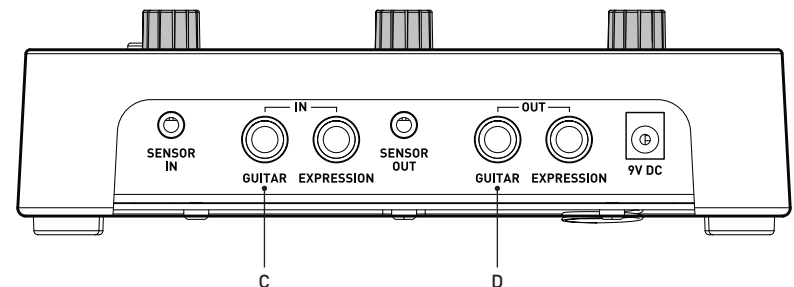
Next, connect the supplied EXTENSION CABLE to the SENSOR IN jack (B). Later, you'll plug the other end into the wire that trails from the Hot Hand, but hold off on that for now.



03 : Guitar/Audio Connections

Now, you'll need to make the audio connections. Plug a regular (mono) ¼-inch guitar cable from your guitar into the GUITAR IN jack (C). Connect your amp (or other audio device) to the GUITAR OUT jack, again with a regular ¼-inch cable (D).

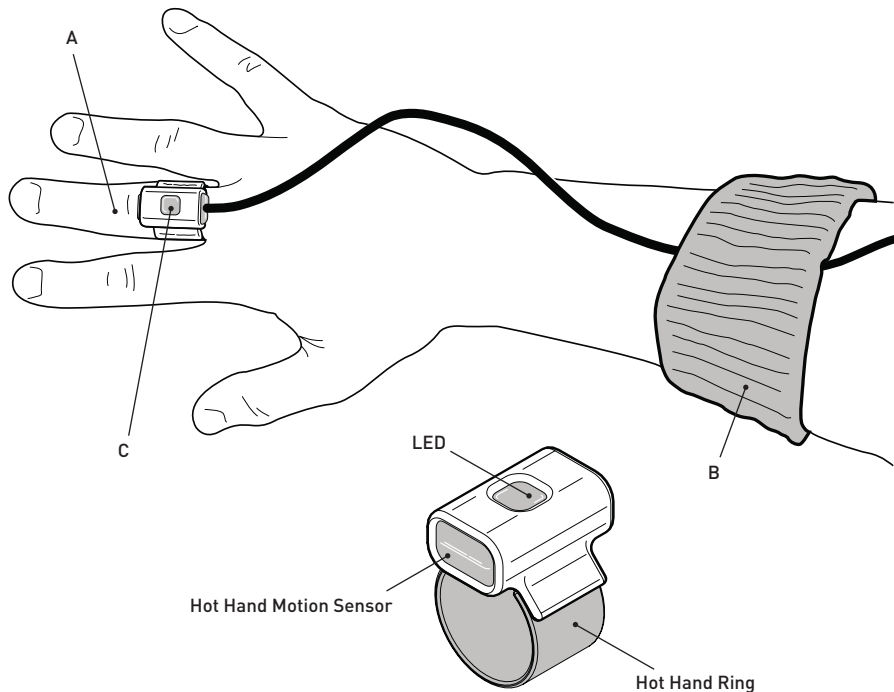
Note: Plugging a cable into the input will turn the unit on, causing some of the LEDs to light up. Don't forget to turn off the unit by unplugging this cord—otherwise the battery will continue to drain.



04 : Attaching the Hot Hand Motion Sensor

Choose the ring size which fits most comfortably. This is ideally placed on the middle or ring finger of your strumming hand [A]. Put your guitar on and take out the Hot Hand sensor. Insert the Hot Hand into the ring as shown. To prevent the sensor cord from interfering with your playing, use the provided arm band (B) to hold it up near your elbow as shown. Once everything is comfortable, attach the wire that comes from the Hot Hand into the EXTENSION CABLE.

Note: the extension cable is not required for operation, but it is almost certainly required for using the product in the standing position. When the Hot Hand is connected, and the control box is powered-on, a blue LED will glow in the sensor to indicate it is ready to be used [C].



05 : Calibration (optional)

Calibration is recommended, but not required. See page 11 for additional information.

Calibration is easy. Just turn the EFFECT knob to the CALIBRATE position and hold your strumming hand in its normal playing position over the strings. Your hand should be held relatively still. Then, tap the ON/OFF pedal once. The ON/OFF LED will blink for a few seconds. When the LED is off, you are calibrated and ready to go. Turn the Effect Selector knob away from the CALIBRATE position to select an effect.

06: How to select and control the effects

Preset Selection

Make sure effects are engaged by checking the ON/OFF light. Toggle the ON/OFF pedal to turn it on, if necessary.

Select any of the four presets by using the SELECT pedal to advance through them. Note which of the MOD SOURCE lights are on at the top of the EFFECT knob. These select what will be sweeping the effect. If the HOT HAND light is not on, moving the HOT HAND will not make any difference.

Editing

- Use the EFFECT knob to select any of the 7 phasers or 7 flangers.
- Hold down the SELECT pedal, and turn the EFFECT knob. It will now change the MOD SOURCE selection instead of making an effect selection.
- Use the DEPTH control to select the amount of modulation depth (sweep) applied to the effect.
- Use the MOTION/SPEED control to select how fast the modulation source varies. It determines how much the Hot Hand responds to rapid motion; it sets the LFO speed; and it controls how quickly the ENVELOPE tracks the levels of the guitar signal.
- Turn the MOTION/SPEED knob such that the LED indicator light moves across the bottom-most part of the range. This will change the state of the INVERT switch. If INVERT is on, both the HOT HAND and ENVELOPE direction of sweep will be reversed.
- When LFO is selected as the MOD SOURCE, turning on INVERT will select SEQ as the modulation source instead of the LFO. Sequencer patterns will then be used to sweep the effect.
- Hold down the SELECT pedal, and adjust FREQUENCY range for the phasers, and DELAY time for the flangers with the DEPTH knob.

Advanced editing

The Back Page parameters provide access to a number of miscellaneous parameters, including control of the sequencer. Press SAVE while holding down the SELECT pedal to edit these parameters. See page 26-30 for a detailed list.

Save Preset

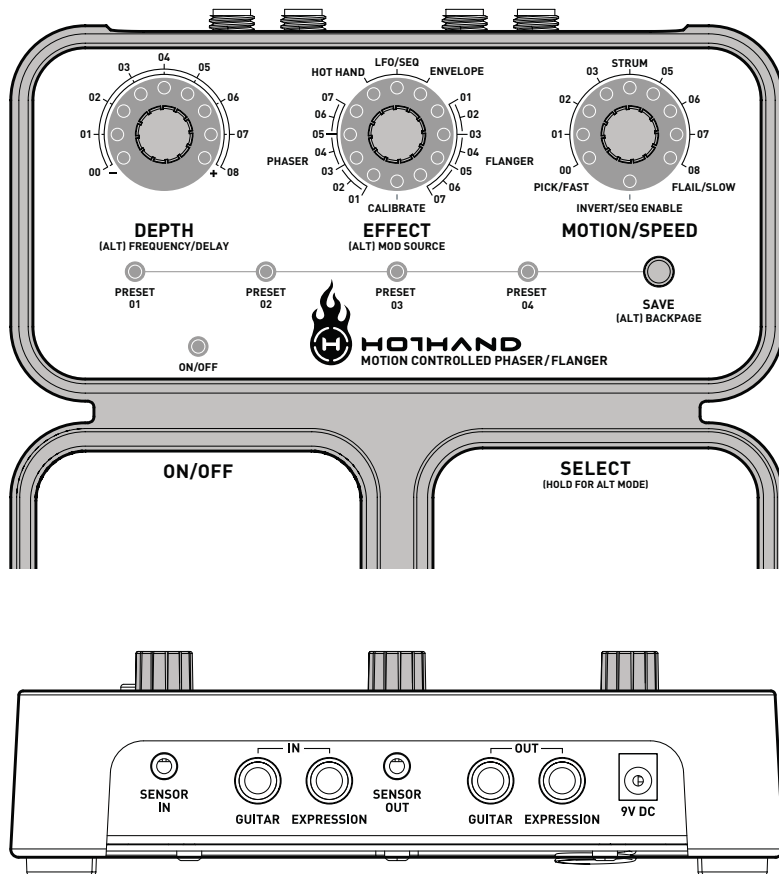
If you wish to save the changes you have made to a preset location, hold down the SAVE button. When the preset LED stops blinking, the data has been saved to the current preset.

Features

The Hot Hand Concept

The Hot Hand provides a new way to control effects. It is no longer necessary to stand over a pedal board. The movement of the picking hand becomes an expression pedal. The control follows the rhythm of the music without conscious effort. It is also possible to move the hand much quicker than a pedal can be moved. The potential for additional showmanship in live performance must not be overlooked.

Some other possible places to put the Hot Hand sensor besides on a finger of the picking hand include shoes, a headband, the guitar headstock, your drummer's hand, your singer's hand... OK, maybe the singer isn't such a good idea.



The Controls

The Hot Hand Control Box is where all of the effects are created and controlled. The product contains 7 different Phasers and 7 different Flangers. Some sounds are classics, others are new, and all have been carefully modeled and created by real musicians. And by using the presets, you can switch between FOUR of those sounds without ever bending down to tweak a knob on stage.

Note that the Hot Hand control box uses rotary encoder knobs and LED rings. This allows you not only see the knob locations in low light situations, but you can also jump from one preset to the next and see the setting of each knob quickly.

The product also gives you one control over each effect: FREQUENCY for the Phaser, which shifts the range of the Phaser sweep, or DELAY for the Flanger, which scales all the delay times. This control will greatly change the sound of the effects. It is independent of the modulation source selection.

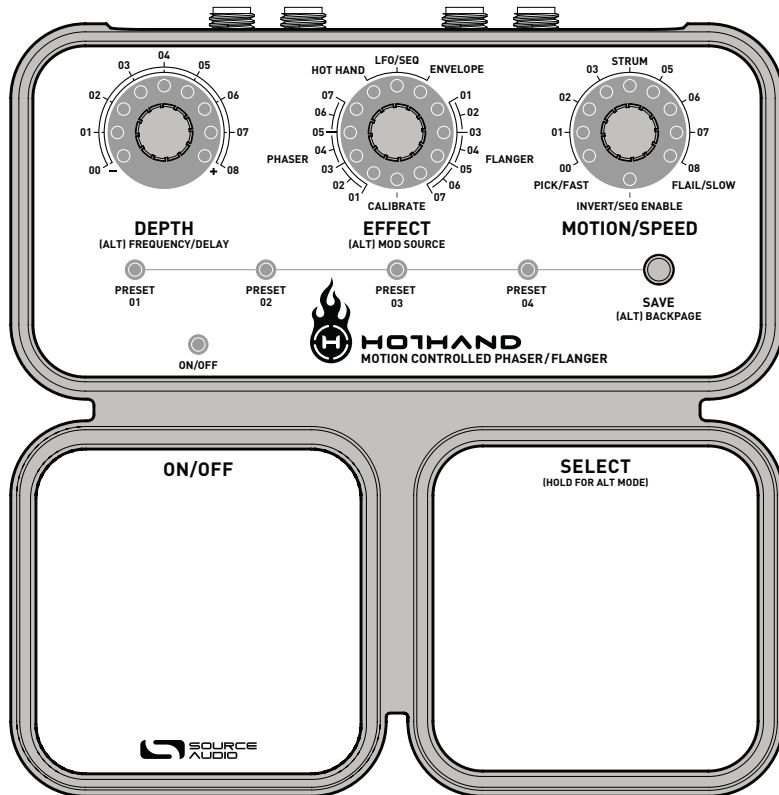
In addition to using the Hot Hand to translate hand motion into a signal to sweep the effects, other modulation sources that may be used are a Low Frequency Oscillator (LFO) that provides a periodic back and forth sweep, a Sequencer that generates a repeating series of control levels, and an Envelope Follower, which responds to the level of the guitar input signal. The MOTION/SPEED control adjusts how fast all of these control sources act, and the DEPTH control adjusts the range of the effect sweep.

There are three other features related to external "expression" control. First, the EXPRESSION IN allows you to control the effects in the Control Box with an external expression pedal. The EXPRESSION OUT allows you to take the final effect modulation signal and use it to control other effects boxes that have an Expression Input feature. Finally, the SENSOR OUT jack allows you to send the Hot Hand signal to other Source Audio Hot Hand products and control them with a single motion sensor.

The ON/OFF pedal switch puts the effect in or out of the circuit. Another way to toggle the effect state is to use the special KNOCK mode. Tapping twice in rapid succession with the knuckles of the hand wearing the ring sensor will switch the effect from On to Off, or from Off to On. The taps should correspond roughly to a rate of 180 BPM. (The time between the taps must be greater than 1/4 of a second, and less than 1/2 second.) It is not necessary to actually tap the ring itself on a solid surface. If you are wearing the sensor on a headband, we do not advise using KNOCK mode. KNOCK mode may be enabled and disabled with a Back Page parameter.

Modulation Sources

The effects may be swept (or modulated) from any of a variety of control signals. The MOD SOURCE knob does the selection, and the amount of modulation is set by the DEPTH control.



Hot Hand

While it is certainly possible to use Hot Hand without much technical background, a few words about how it works will allow you to quickly understand how hand position and hand motion impact the sound. The Hot Hand sensor senses acceleration. This means that both hand position and hand motion will cause the Hot Hand to react and send signals to the control box.

Hand Position

Since gravity is an acceleration, the Hot Hand is always measuring the pull of the Earth's gravitational force. To illustrate this, try strumming a chord and pointing your hand with the sensor attached straight at the ground. By bending your arm at the elbow, slowly move your forearm up until your hand is pointing at the ceiling. You should hear the effect sweep following the position of your arm. When the INVERT light is on, the opposite will be true and the same gesture will sweep the effect in the opposite direction. You don't need to move your entire arm to accomplish this. The same effect can be achieved changing your hand position by bending at the wrist or by leaning back and moving your hand and the guitar together. Hand position can range from subtle movement to the not so subtle. If subtlety is not your thing, dramatic motions will open the door for showmanship as your hand shapes the sounds from your guitar. We must point out that the Hot Hand will respond differently in Outer Space!

When you are using hand position and larger hand or arm motions to control the Hot Hand, we recommend turning the MOTION knob towards FLAIL. This will prevent the Hot Hand from responding to small variations and sounding too "jittery".

Hand Motion

In addition to measuring gravitational force, the sensor also measures movement. The more the hand moves, the more the signal will change. To illustrate this, strum a chord and shake your hand quickly. You should hear the filter sweep back and forth following your hand motion. Experiment with moving your hand in different directions and at different speeds to find the method that works best for you. Use the MOTION/SPEED knob to control how quickly an effect will respond to your hand motion. In the most sensitive position (PICK) the Hot Hand will detect even the slightest motion of the picking hand. In the STRUM position, the Hot Hand will react more slowly. Try strumming some chords normally and listen to how the Hot Hand reacts.

Calibration (optional)

Your use of Hot Hand will benefit from the unit being calibrated to your playing position and style. In effect, you are telling the control box where your hand is when it is centered over the strings. Calibration is recommended when using for the first time or when your playing position changes due to guitar strap changes or when moving from standing to sitting. If you do not calibrate, the “zero” or center point of the Hot Hand signal may not match the natural resting position of your hand.

To calibrate, turn the EFFECT knob to the CALIBRATE position and hold your strumming hand in its normal playing position over the strings. Then, tap the ON/OFF pedal once. The ON/OFF LED will blink for a few seconds. When the LED is off, you are calibrated and ready to go. Please note that the effect will be muted when the selector is in the CALIBRATE position.

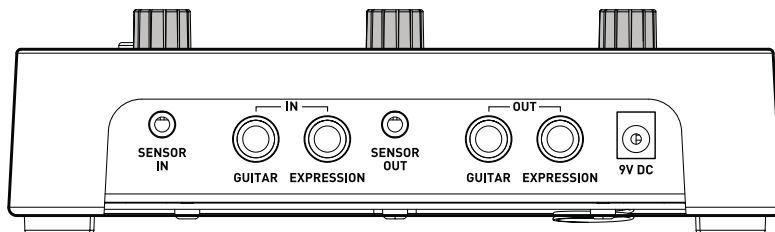
Calibration data is remembered until another calibration is performed, even when the unit is turned off.

ADVANCED USER NOTES

- 1) The calibration “zero” point does not necessarily need to be in the middle of your arm stroke. By setting the zero point higher or lower it is possible to span a different range of the effect. Also, calibration may be required if the Hot Hand sensor is mounted to some other part of your body (head, foot, etc.)
- 2) One calibration setting is typically used across all presets. However, it may be desirable to create a different calibration setting for each preset. When the function selector is turned to CALIBRATE all the preset LEDs will be lit, indicating that you will be recalibrating all the presets. If, before depressing the ON/OFF pedal, one hits the SELECT pedal, the light from the last preset selected turns on. If only one preset LED is lit, then only that preset gets the new calibration data. The remaining presets are unaffected, even if the last calibration applied to all presets. Pressing SELECT again toggles back to selecting all presets.

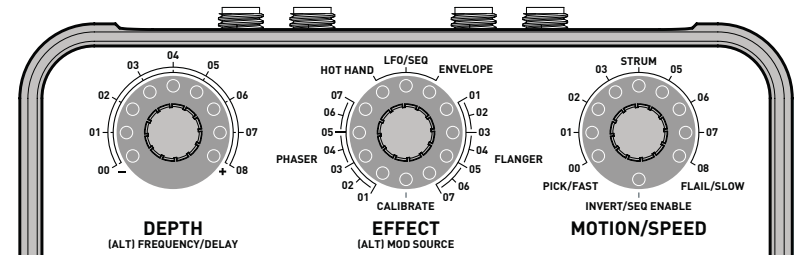
Expression input

If a modulation control signal is needed that is more appropriately generated by a controller like a wah pedal, an external expression pedal may be plugged into the EXPRESSION IN jack.



LFO

Phasers and flangers are typically controlled by an automatically slowly varying signal called a Low Frequency Oscillator (LFO). An LFO may be selected as the modulation source. In addition to the MOTION/SPEED knob, the speed may be controlled by an external expression pedal, or by the Hot Hand. The LFO produces a sine wave to modulate the Flanger, and a triangle wave for the Phaser. The LFO may also be switched to become an audio frequency oscillator. It can provide ring-modulated sorts of sounds. This option is only for the seriously crazed.



Sequencer

A sequencer is a device, more commonly associated with synthesizers, that puts out a repeating series of control levels. While not often found on phasers and flangers, it is quite an interesting sound. The LFO may be switched into driving such a sequencer, by turning on the INVERT switch from the MOTION/SPEED knob. 9 different sequence lengths are available, and for each of these lengths there are 9 different prestored patterns that may be chosen.

A transition time may be set that determines how rapidly the control signal moves from one level to the next when the sequencer moves on to the next step.

Instead of putting out a repeating series of levels, the sequencer may be switched into choosing a random value each time the next step is taken.

See page 31 for a full description of the sequencer control parameters.

Envelope follower

An envelope follower takes the incoming guitar signal and generates a control signal which gets larger for louder guitar signals. This control signal may be used as a modulation source.

The attack rate, or the time it takes for the control signal to rise up after a new note has been struck, may be adjusted. Staccato playing, with a very brief period of silence between notes, will give the most dramatic results, by allowing the control signal to be reset back to zero during the silence.

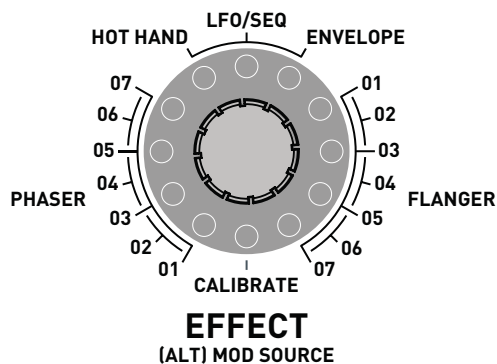
Knobs

EFFECT Knob

The EFFECT knob switches between the various different effects. For a description of each effect, please see page 24. There are 7 Phasers and 7 Flangers to select from. Some of the selection positions are “between” the positions marked by the LEDs; these are indicated by having both bracketing LEDs on at the same time. Thus, when Phaser 02 is selected, the LEDs for Phaser 01 and Phaser 03 are both on.

The effects selection jumps past the topmost three LEDs, to go directly from Phaser 07 to Flanger 01. Going from Flanger 07 to Phaser 01 requires going through the position labeled CALIBRATE. Simply scrolling through CALIBRATE does not invoke the calibration function (although it does temporarily mute the audio.)

The LEDs around this knob always display the current MOD SOURCE, as one of the topmost three LEDs. The three choices are HOT HAND, LFO/SEQ, and ENVELOPE. The selection may be changed by holding down the SELECT pedal, and moving the knob.



DEPTH Knob

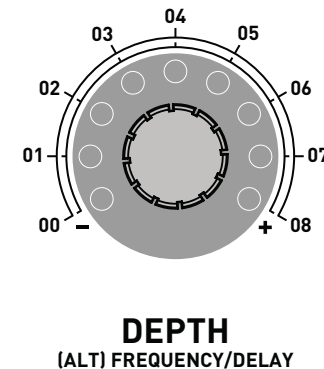
The DEPTH knob sets how much of the selected modulation source is used to modify the frequency responses that are created by the Phaser or Flanger algorithms.

When using the Hot Hand as the selected modulation source, any signal present at the EXPRESSION IN jack is summed with the Hot Hand signal. The Hot Hand signal is controlled by the DEPTH control, while the EXPRESSION IN signal is not. Thus the pedal always has the full range of control.

FREQUENCY/DELAY Knob

If the Phaser effect has been selected, the FREQUENCY/DELAY knob acts as an offset for the Phaser’s frequency response characteristic. Counterclockwise values will position the typical Phaser notches at lower frequencies than will clockwise values.

If the Flanger effect is selected, the FREQUENCY/DELAY knob scales all of the delay times used in the Flanger together. Counterclockwise settings give short delays, which will have fewer notches in the Flanger frequency response. Clockwise settings will give longer delays, producing a more complex sound.

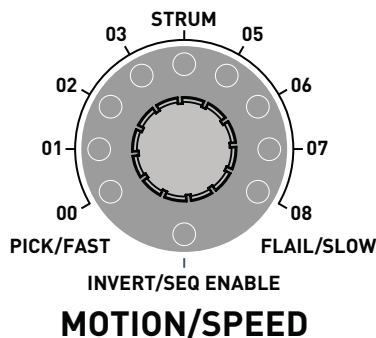


MOTION/SPEED Knob/INVERT

If Hot Hand has been selected as the MOD SOURCE, the MOTION/SPEED knob essentially determines how sensitive the Hot Hand is to rapid motion of the sensor. Setting this knob towards “Pick” will make the Hot Hand more sensitive so that even the quickest motions will be picked up. Setting it to near “Strum” is best for strumming, and “Flail” will reduce the sensitivity so that only more dramatic (slower) motions will produce a noticeable effect. Alternatively, the motion knob can be thought of as setting the amount of “smoothing” of the Hot Hand signal. “Pick” having the least smoothing, while “Flail” has the most.

The “Pick” position will pass more of the very rapid transient motion caused by the jar of hitting a string with a pick to go into the final control signal. It can produce something like an envelope follower type of sound. As the knob is rotated clockwise, less of these quick transients are passed, and things seem less jittery. You really have to do some experimenting with this control in order to get a feel for how to adjust it to match your playing style and the sound you are trying to get.

Turning the MOTION/SPEED knob all the way around past the six o’clock position causes the Hot Hand to invert its axis—up is down and down is up. When the INVERT light is off, the product is in normal mode, while on indicates inversion. For the Phaser, with normal mode, the hand up position moves the frequency response notches to higher frequencies, and with invert moves them to lower frequencies. For the Flanger, normal mode and hand up position generally makes the delay lines longer, and thus increases the number of frequency response notches present.



If ENVELOPE has been selected as the MOD SOURCE, the MOTION/SPEED knob sets how fast the envelope signal rises and falls in response to the guitar input signal. Counterclockwise is faster, and clockwise is slower. The INVERT switch flips over the direction of modulation sweep by the envelope.

If the LFO has been selected as the MOD SOURCE, the MOTION/SPEED knob becomes the rate control for the LFO. Faster rates are in the counterclockwise direction. (Note that regardless of the specific modulation source selected, things happen faster with the MOTION/SPEED knob set toward the counterclockwise direction.) The range of the LFO is from .2 Hz to 10 Hz (or a period of five seconds down to one-tenth of a second.)

If an expression pedal is plugged in to the EXPRESSION In jack, it will modify the LFO speed as set by the MOTION/SPEED control. When the pedal is in the full down position, all LFO rates are divided by a factor of 2.88, while a full up position multiplies all rates by 2.88. (Use of an expression pedal thus increases the range of LFO speeds.) The fastest speeds can produce something of a ring modulated sound.

There is a Back Page parameter that may be set to permit use of the Hot Hand for controlling the LFO speed, instead of the pedal. This may be of marginal utility if the sensor ring is worn on the picking hand, but nice results can be obtained with the ring worn on the player’s head or on the guitar body.

The INVERT switch turns the LFO into a “preset” sequencer. A variety of patterns, of different lengths, are pre-stored. The Back Page parameters may be used to choose the pattern and length. Also available is the transition time from one step to another. Finally, instead of a repeating sequence of levels, a random value may be chosen each time the level changes.

When using the sequencer, there is one step per LFO period. The slowest LFO rates for normal LFO mode become too slow to be useful with the sequencer, and so the slowest LFO speed has been increased to 1 Hz, while the fastest rate remains the same at 10 Hz. Control by an expression pedal is still by the same factors.

Connections

SENSOR IN

Connect the Hot Hand here directly or using the supplied EXTENSION CABLE.

GUITAR IN

This is where you connect your guitar to the box, using a standard ¼-inch guitar cable.

Technical Note: The input impedance is 2.2 M. The maximum signal should not exceed 4.2 volts peak-to-peak.

EXPRESSION IN

This input allows you to connect any standard expression pedal to the product. The EXPRESSION IN signal is summed with the Hot Hand, when the MOD SOURCE is set to Hot Hand. If the Hot Hand is disconnected, then the pedal will have exclusive control. If the MOD SOURCE is set to LFO, the EXPRESSION IN signal will control the LFO speed. EXPRESSION IN is unused when the MOD SOURCE is set to ENVELOPE.

Technical Note: The pedal needs to have a linear taper potentiometer, from 10K to 100K, with one side connected to ring, and the other to ground, and the wiper connected to the tip of the TRS ¼-inch connector. We have found that the Moog and M Audio EXP pedals work well. Audio taper pots, as commonly found in volume control pedals, will not give good results.

Very Technical Note: An external control voltage source, such as from an analog synthesizer, may be connected to the EXPRESSION IN jack. A mono ¼-inch cable may be used for this application. Do not allow the input voltage to go negative with respect to ground.

SENSOR OUT

This output can be used to “pass on” the Hot Hand signal to other Source Audio Hot Hand Products (such as the Motion Controlled Wah Filters) so that one Hot Hand Sensor will control multiple effects. This application is also known as “Daisy Chaining”.

- **WARNING!** Do not connect this to any device other than the SENSOR IN jack on another Source Audio product. Damage may result.

GUITAR OUT

This ¼-inch output is where you connect your amp or the next pedal in your chain.

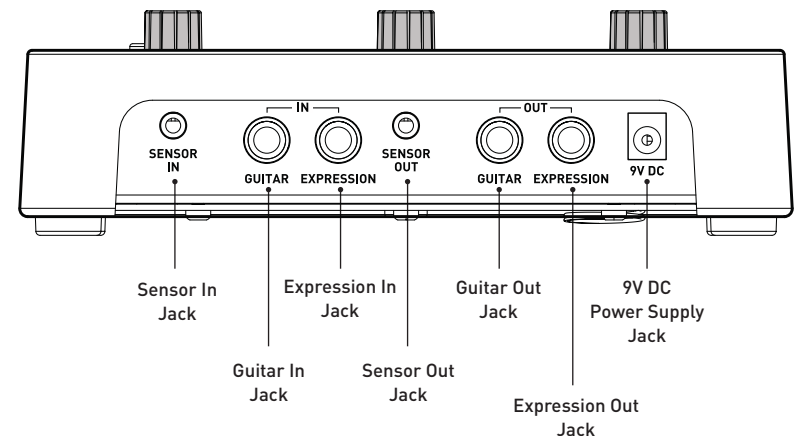
EXPRESSION OUT

This jack allows you to send the Hot Hand control signals, or whatever modulation has been selected by the MOD SOURCE control, to other effects devices that accept an expression input. This output signal defaults to an analog voltage ranging from zero to 3.3VDC. This signal is “tip hot”. The maximum voltage can be adjusted up to 4.5VDC to accommodate other devices that require higher voltages. For details on adjusting the voltage range see the Back Page Parameters section on page 24. Note that this output is active at all times when the Control Unit power is On. **BE SURE TO READ THE DOCUMENTATION ON ANY DEVICE YOU USE WITH THE HOT HAND IN THIS CONFIGURATION.**

9V DC

Connect a 9V DC power supply here if you do not wish to use batteries. Batteries will not be drained while the power supply is connected. Power supply must be REGULATED, minimum 200mA, and use a NEGATIVE tip plug. A negative tip plug is generally indicated by the symbol ⊕ ⊖ on the power supply.

Use of a non-Source Audio approved supply may cause damage and void the warranty.



Pedals

ON/OFF (left) Pedal

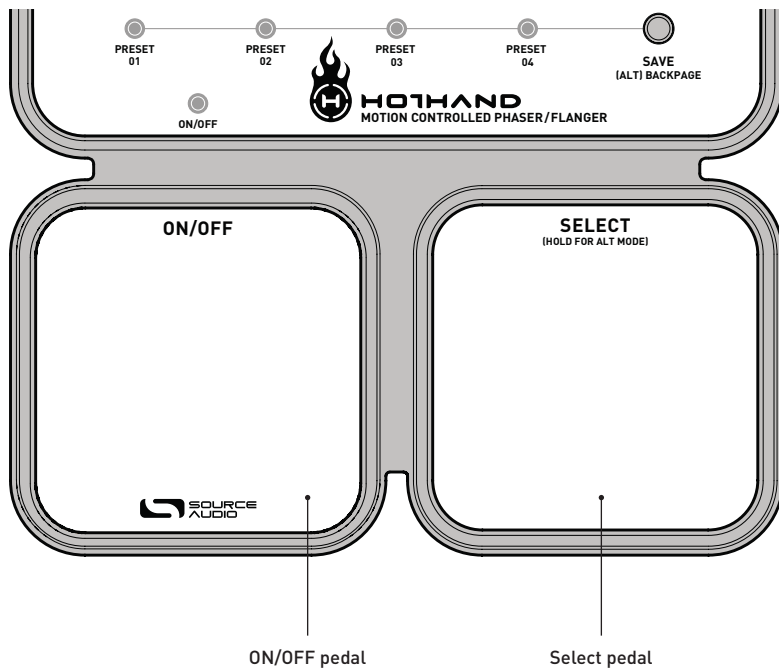
Pressing this pedal once engages the effect that is selected. Pressing the pedal again will turn the effect off and the bypass on. There is an ON/OFF LED right above the pedal that notifies you when the effect is turned on.

Technical Note: In bypass mode, the signal still passes through a unity-gain, high input impedance, low noise buffer.

SELECT (right) Pedal

The SELECT pedal cycles through the 4 presets in a repeating pattern. The 4 LEDs above this pedal indicate which preset has been selected.

The preset will change when the pedal is released. If the SELECT pedal is held down, it invokes ALT MODE, which changes the function of the DEPTH and EFFECT knobs to FREQUENCY/DELAY and MOD SOURCE. ALT MODE also changes the SAVE button into a switch to enter the Back Page parameter editor. When the SELECT pedal is held down long enough to go into ALT MODE, the preset selection will not advance upon pedal release.



Saving Presets

The PRESET feature of this product has been designed to be simple. This product allows you to save 4 different configurations so that they may be easily recalled from the standing position. When you receive your product from the factory, we have selected what we think are 4 useful configurations. You may either keep these or replace any of them with your own settings. Should you wish to return to the original factory presets, see the Restore Defaults section on page 33.

01 : Select and edit a preset

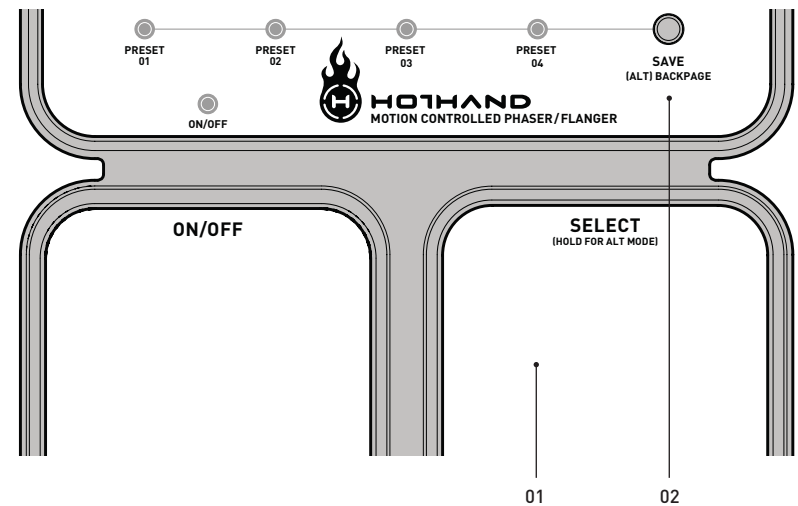
By stepping on the SELECT pedal you can select one of four user presets. Edit a preset by changing values for DEPTH, FREQUENCY/DELAY, EFFECT, MOD SOURCE, MOTION/SPEED or INVERT. Any time that you change the knob positions of a given preset, that preset LED will blink slowly to indicate that the preset has been edited.

02 : Press and hold the SAVE button for two seconds

The preset LED will blink rapidly to signal that the saving process has begun. When the light becomes solid, the save process is complete. Note that this process will over-write any setting that was previously stored in this location.

ADVANCED USER NOTE

It is possible to save different calibration settings for each preset. The procedure is described in the CALIBRATE section on page 12. Different settings of the Back Page parameters may also be saved for each preset. See page 24.



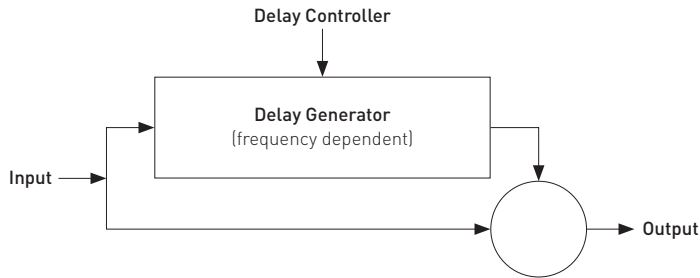
Effect Types

Following are descriptions of the different effect types we programmed into the Hot Hand box. Note that each sound interacts differently with both the Hot Hand hand motions, or other modulation sources, as well as the settings on the DEPTH, FREQUENCY/DELAY and MOTION/SPEED knobs. It is suggested that you experiment a bit to find just the right sound for different playing styles.

Phasers

The input signal goes into a number of phase shift sections. Each section has a control which determines the frequency around which the resultant phase shift makes a smooth transition from 0 degrees to -180 degrees. The output of the last phase shifter is combined with the input. Any frequencies at which the shifted signal is an odd multiple of 180 degrees from the input will undergo total cancellation, producing a notch in the spectrum. Some of the shifted signal may be fed back to the phase shift chain. Frequencies which are a multiple of 360 degrees from the input will be boosted, causing a peak in the spectrum. This is called resonance.

The number of phase shift stages and the amount of feedback are hard-wired for each of the Phaser algorithms. Note that for every 2 stages of phase shift section, one obtains one notch in the frequency response.

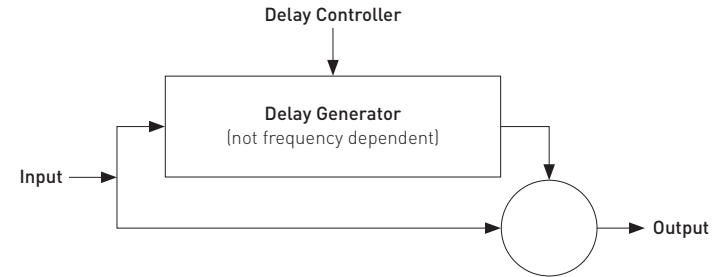


Phaser Algorithms

- #1 A model of one of the oldest rotating speaker simulators. 2 notches, but one is such low frequency as to be nearly inaudible. No resonance.
- #2 Standard 2 notch. Some resonance.
- #3 Standard 3 notch. No resonance.
- #4 Standard 4 notch. Some resonance.
- #5 Standard 6 notch. Some resonance.
- #6 6 notch, but shifted signal subtracted from input rather than added. Produces a hollow sort of sound. No resonance.
- #7 2 notch, but 6 peaks. Some resonance.

Flangers

A Flanger works very much like a Phaser, except that instead of using a chain of phase shifters, a delay line is used. The length of time a signal is delayed is controlled by the modulation. The sum of the delayed signal with the input signal produces notches at frequencies where there is cancellation. Feedback will introduce resonance peaks between the notches. At short settings of the DELAY time control, there will be fewer notches in the Flanger's frequency response than at long delays.



Flanger Algorithms

- #1 Classic Flanger.
- #2 Delayed subtracted from input, producing a hollow sound.
- #3 Multiple, individually varying, delay lines summed.
- #4 High resonance, peaks only, no notches.
- #5 Multiple delays, no resonance.
- #6 Multiple delays, with resonance.
- #7 Delayed signal only, no flanging effect. Meant for pitch modulation, such as vibrato. There are some small resonance peaks, so that vibrato doesn't sound too sterile and mechanical. Slow modulation will be nearly inaudible. Shorter delay times will produce less of an effect than long delay times.

Order of Effects

A controversial subject, to be sure. But phasers and flangers will give more dramatic results if there is more high frequency content to the sound being processed. A distortion box will do just that, if it is in front of the phaser or flanger. Distortion following a phaser or flanger, on the other hand, tends to fill in the notches in the frequency spectrum and obscure the effect. Let your ears be your guide.

A compressor in front of this product will somewhat reduce the range of the envelope follower signal, since it will be reducing the loudness variations. Total, over-the-top mega-distortion before the effect can be a problem for the envelope follower, because it removes all of the dynamic range of the guitar signal, and tends to fill in what would be silence between notes with hum and noise.

Back Page Features and Controls

We have tried to balance the conflicting requirements of flexibility and simplicity in this unit. Thus, a number of parameters appear in what we call Back Page editing. These are parameters that, in general, will not need as frequent adjustments as the controls that are directly accessible from the front panel. (These parameters, along with the presets, may be restored to the factory settings through the Restore function.)

To get into this special editing mode, hold down the SELECT pedal, and then push and hold the SAVE button for 2 seconds. The unit will then stay in this editing mode without any controls being held down. The DEPTH and EFFECT knobs will be used to edit the parameters. To exit from this mode, turn the function selector to the CALIBRATE position. An indication that the unit is in Back Page editing mode is the lack of any lit LEDs around the MOTION/SPEED knob.

Each preset has its own independent set of Back Page parameters. When entering the Back Page parameter editor, either all the preset LEDs will be lit, or only the one corresponding to the currently selected preset. Hitting the SELECT pedal will toggle between these two states. Any changes made to any particular parameter will be made to all presets if all the preset LEDs are on; otherwise, the change will only be made to the current preset. Thus, it is easy to go in and change the Hot Hand axis selection for all presets, or to change the sequencer pattern for only one preset. Without exiting from the Back Page editor, you can make changes for all presets, and then some changes to only the current preset.

The EFFECT knob selects the parameter to be edited and the DEPTH knob displays the current value and allows adjustment. The displayed value of each parameter is taken from the stored value for the current preset. All changes are saved automatically as they are made, either to all the presets, or only the current preset. If no change is made with the DEPTH knob, then nothing is saved, even though all the preset LEDs may be lit. Thus, you do not have to worry about replacing all the parameters for all presets merely by scrolling through the parameters when all the preset LEDs are lit.

Generally the values on the DEPTH control run from minimum at CCW (0) to maximum at CW (8). There are only 9 possible values per parameter; there are no in-between values. The current effect settings will be used while editing, and Back Page parameter changes will be heard immediately.

Parameters	EFFECT knob
Input trim	Phaser 01
Hot Hand Gain	Phaser 03
Hot Hand X/Y axis rotation	Phaser 05
Expression out scaling	Phaser 07
Restore factory settings for all presets and Back Page parameters. Use SELECT pedal to engage.	HOT HAND
Hot Hand to LFO speed	LFO/SEQ
Knock control	ENVELOPE
Sequencer/random select	Flanger 01
Sequencer pattern select	Flanger 03
Sequencer length select	Flanger 05
Sequencer transition rate	Flanger 07
Exit	CALIBRATE

Input gain trim (Effect=Phaser 01)

This is a gain adjustment applied to the guitar signal immediately after A/D conversion. The possible values are -8, -6, -4, -2, 0, 2, 4, 6, and 8 dB. Positive values may be helpful for low level signals. If the input signal is particularly hot, some attenuation may be required in order that the outputs of some of the effects with the most resonance does not clip. This may also be used as a per-preset volume adjust.

Hot Hand gain trim (Effect=Phaser 03)

This adjusts the gain multiplier applied to the Hot Hand signals relative to the zero point from calibration. The lowest gain is .5, and the highest is 2.0. The default of 1.0 is in the center position. The higher gains may be useful if you like to use small hand motions and the lower gains if you prefer larger hand motions. When using higher gains, calibration becomes more necessary.

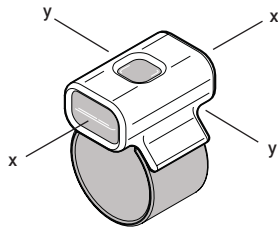
Hot Hand x and y-axis interchange (Effect=Phaser 05)

The Hot Hand sensor uses a two axis accelerometer. By default, the Hot Hand senses acceleration along the x-axis. The x-axis runs parallel to your arm and the long dimension of the sensor ring. The y-axis is perpendicular to x, while still being in the plane of an outstretched hand wearing the ring. We generally find that the x-axis gives better control than the y-axis, but feel free to experiment, especially if your playing technique is somewhat unconventional. (Lefties—no, you still want to use x, but the normal and inverted settings are effectively switched.)

Please note that if you are using the y-axis that you may need to re-calibrate with your hand and the sensor parallel to the ground (palm down). This will allow you to set a useful “zero” point for the y-axis.

The default setting of the x-axis sensor is indicated by the top-most LED on the DEPTH knob. The next LED, in either direction, indicates use of an axis midway between x and y (a 45 degree angle.) Another step in either direction gets us to the y-axis. The complete set of 9 choices, from counter-clock-wise:

DEPTH Knob	Axis
0	-x
1	Halfway between -x and -y
2	-y
3	Halfway between -y and x
4	x
5	Halfway between x and y
6	y
7	Halfway between y and -x
8	-x



Note that a selection of -x acts the same as a selection of x with the INVERT switch on. The INVERT setting on the MOTION/SPEED knob will always act to invert whichever axis direction is chosen.

Expression control output gain trim (Effect=Phaser 07)

This allows adjustment of the level of the signal on the EXPRESSION OUT jack. The default is position 2. This will result in a signal that varies between zero and 3.3VDC. The maximum output voltage is 4.5VDC. Note that greater changes in signal can also be produced by faster motion of your hand. Higher gain will allow you to use slower motions to achieve the desired signal levels.

Restore defaults (Effect=Hot Hand)

When the EFFECT knob is set to restore (HOT HAND) in the Back Page mode, depressing the SELECT pedal will reset all of the Back Page parameters to their default settings, along with the Presets.

Hot Hand to LFO Speed (Effect=LFO/SEQ)

When this parameter is in the center, or OFF position, (which is the default value) an expression pedal plugged into the EXPRESSION IN jack may be used to control the LFO speed. This is the default. Away from this position, the pedal is disabled, and the Hot Hand takes over. There is a range of four values that determine how much change there is in the LFO speed. These values are also repeated with a negative sign, indicating that the direction of control by the Hot Hand is inverted. (The INVERT switch cannot be used for this purpose, since it is being used for selecting either the LFO or the Sequencer. The SPEED control is also used to set the initial LFO speed, and thus it cannot control the speed of response to the Hot Hand motion. The Hot Hand motion speed is automatically set to the middle of the range of the SPEED control.) The maximum range of control with the Hot Hand is the same as the control range with the pedal.

DEPTH Knob	Relative LFO Speed Mod	Speed Multiplier Range
0	-1.0	x2.88 to x.35
1	-0.75	x2.21 to x.45
2	-0.50	x1.70 to x.59
3	-0.25	x1.30 to x.77
4	0.0 (Use continuous control pedal instead)	
5	0.25	x.77 to x1.30
6	0.50	x.59 to x1.70
7	0.75	x.45 to x2.21
8	1.0	x.35 to x2.88

KNOCK control (Effect=Envelope)

This parameter enables the unit to be toggled between effect on and effect off by tapping the sensor wearing hand against a hard surface, such as the guitar. There is a threshold level, which may be adjusted as needed. Higher thresholds will need a harder tap to be recognized, but there will be less chance of an accidental trigger from normal hand motions. Somewhere in the middle of the range will generally be best. Note that this control may be used regardless of whether or not the Hot Hand is being used as a modulation source.

DEPTH Knob	Threshold
0	KNOCK is disabled (default setting)
1	Lowest threshold (easiest)
2	
3	
4	
5	
6	
7	
8	Highest threshold (hardest)

Sequencer Controls

There are 9 patterns available for each of 9 length selections. The first length selection is for a length of 3. It also includes the only possible length 2 pattern, a square wave. Since there aren't enough other length 3 patterns to fill out the entire list of 9 patterns, several length 6 patterns are also included. The other lengths, from 4 through 12 (excluding 11) are all consistent through each of their patterns. A brief description of the nature of the patterns is in the table below. For lengths 9, 10, and 12, the narrow pulse pattern (all steps at the lowest level, except for one at the highest) seemed pointless, and so a more complicated pattern was used.

Sequence/Random (Effect=Flanger 01)

This parameter determines whether the sequencer will cycle through the pre-stored sequence patterns, or use random values that don't repeat. If random is selected, the pattern and length parameters are ignored.

Piggy-backing on this parameter is the ability to speed up the LFO by a factor of 100. This speed up applies even if the sequencer is not selected.

DEPTH Knob	Seq/Ran
0	Use sequence patterns (default setting)
1	Use random levels
2	Use sequence patterns; LFO speed is 100 times faster than normal
3	Use random levels; LFO speed is 100 times faster than normal

Pattern (Effect=Flanger 03)

The sequence pattern selection.

DEPTH Knob	Pattern description
0	triangle
1	rising saw
2	falling saw
3	narrow pulse (lengths of 9, 10, and 12 have other complex patterns)
4	only 3 different levels present in the pattern
5	only 2 different levels present in the pattern
6	complex patterns (default setting)
7	complex patterns
8	complex patterns

Length (Effect=Flanger 05)

The sequence length selection. The selections are:

DEPTH Knob	Length
0	2/3/6
1	4
2	5
3	6
4	7
5	8 (default setting)
6	9
7	10
8	12

A selection of 0 on the DEPTH knob for the length parameter can yield any of three different lengths (2, 3, or 6), depending on the selected pattern:

Pattern Selection	Length
0	2
1	3
2	3
3	3
4	3
5	6
6	6
7	6
8	6

Transition (Effect=Flanger 07)

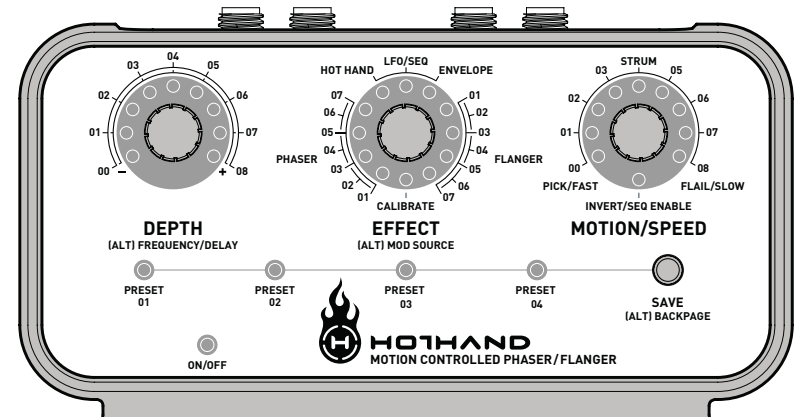
The time taken for the sequencer control signal to smoothly move from one sequence level to another. A value on the DEPTH knob of 0 gives the longest transition time, and 8, the shortest. The fastest ones may sound clicky or glitchy as the control signal moves very quickly from one level to the next. The slowest ones can remove the sense of discrete steps, when the sequencer is set to a high rate.

DEPTH Knob	Transition Rate
0	Slowest
1	
2	(default setting)
3	
4	
5	8 (default setting)
6	
7	
8	Fastest

Factory Presets

These are the presets that the unit ships with. The notation for the DEPTH, FREQUENCY/DELAY, and MOTION/SPEED knobs is as follows: There are 9 positions around each knob, numbered 0 to 8. There are 3 intermediate values between each numbered position, which will be written as .25, .50, and .75. Thus a value of 6 means that only the LED in position 6 is lit, while 6.75 means that the knob has been turned three clicks beyond 6, and that both LED's 6 and 7 are lit, with 7 being brighter than 6.

PRESET	01	02	03	04
DEPTH	5.50	7.75	4.75	7.25
FREQUENCY/DELAY	1.50	2.50	3.00	8.50
EFFECT	PHASER 03	FLANGER 01	PHASER 02	FLANGER 06
MOD SOURCE	HOT HAND	HOT HAND	LFO/SEQ	LFO/SEQ
MOTION/SPEED	4.00	5.50	4.75	1.75
INVERT	Off	Off	Off	On



Back Page Parameters (default values)

- Input trim 4
- Hot Hand Gain 4
- Hot Hand X/Y axis rotation 4
- Expression out scaling 2
- Hot Hand to LFO speed 4
- Knock control 0
- Sequencer/random select 0
- Sequencer pattern select 6
- Sequencer length select 5
- Sequencer transition rate 2

Specifications

Dimensions

- L: 7.125 inches (18.1cm)
- W: 7.125 inches (18.1cm)
- H: 1.75 inches (4.5cm)

Total including knobs:

- H: 2.125 inches (5.5cm)

Weight

- 5lbs/2.27kg (floor unit only)
- 7lbs/3.18kg (total, including case)

Power

- 130mA @ 9 VDC
- 15-20 hours of battery life
- NEGATIVE tip power jack

Audio Performance

- 115dB audio ADC
- 24 bit audio conversion
- 56 bit digital data path
- Active analog bypass utilized when effect not engaged

Troubleshooting

Noise

Low Power	Change batteries or plug in a DC power supply.
Near noise source	Move control box away from power supplies and other equipment.
Other equipment	Remove other boxes from signal chain, see if noise persists.
Bad cables	Swap out audio cables.

Low volume

Low power	Change batteries or plug in a DC power supply.
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Hot Hand doesn't work

Low power	Change batteries or plug in a DC power supply.
Not calibrated	Calibrate the Hot Hand - see page 14.
Different modulation source selected	Change EFFECT knob position to HOT HAND while holding down the SELECT pedal.
Not connected	Check data cable connections.

Knobs don't work /light up

Low power	Change batteries or plug in a DC power supply.
Plug inserted into GUITAR IN is corroded	Use a good cable.
A stereo (TRS) cable has been used for GUITAR IN	Use a mono cable only.
Wrong power supply	Use correct power supply as defined on page 21.

Unit repeatedly runs briefly, then stops working

DC power supply puts out more than 9 volts	Use proper 9 volt supply.
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For additional assistance, please visit www.sourceaudio.net.

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About Source Audio

Source Audio was founded in January 2005 by former engineers, scientists, and executives of Analog Devices, Kurzweil Music Systems, and Thomas H. Lee Partners. With over 80 years of broad combined industry experience, we bring to the audio effects market a powerful team with skills in analog and digital circuit design, algorithm and effects development, and marketing and business management.