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## SETTING UP AND PLAYING THE MOOG *ETHERWAVE* ® THEREMIN

### INTRODUCTION

The theremin is an electronic musical instrument played by the free movement of the performer's hands in the space surrounding it. This method of playing gives the theremin tone its unique ethereal and dramatic quality, while at the same time allowing the performer a measure of artistic freedom that other musical instruments do not offer. The techniques of playing the theremin can be mastered by anyone who has a good musical ear, and who is willing to invest a modest amount of practicing time. Two motions are involved. Movement of the right hand toward the pitch antenna controls pitch, while movement of the left hand toward the volume antenna controls loudness or volume.

The Moog *ETHERWAVE* theremin is powered by a special adapter which plugs into a standard 110-125 volt grounding power outlet. It is designed to operate with a wide range of amplifier-speaker combinations.

### PREPARING THE *ETHERWAVE* THEREMIN FOR PLAYING

Your *ETHERWAVE* theremin is completely assembled. Only the following preparations for playing are necessary: a) Placing the instrument on a stand, b) attaching the two antennas, c) connecting the power adapter, d) connecting the amplifier-speaker with an audio cord, and e) setting the panel adjustments. Each of these steps will now be described in detail. Note that the steps of

preparation are listed in the order in which they are to be executed.

a) Placing the instrument on a stand: The *ETHERWAVE* theremin requires either a standard microphone stand (preferred) or a small table 36" to 42" high. If a table is used, no objects on the table should be within a foot or two of the theremin, and the theremin itself should be positioned so that the the volume antenna will overhang the edge of the table. Whichever type of stand is used, the *ETHERWAVE* should be securely mounted, and away from walls and other large stationary objects.

b) Attaching the two antennas: The pitch antenna, which is the long straight tube, is placed in the elbow (right angle) fitting on the right end of the instrument, with the brass compression ring down. The mounting nut is slipped over the antenna and screwed onto the fitting. The nut need be only finger-tight, but should be tight enough so that the antenna is firmly in place.

The volume antenna, which is the tubular loop, is placed in the straight fittings on the left end of the instrument, with the bulge in the loop facing forward and down. The mounting nuts already on the antenna are screwed onto the fittings. The nuts need be only finger-tight, but should be tight enough so that the antenna is firmly in place.

c) Connecting the power adaptor: The *ETHERWAVE* is powered by a special adaptor which is grounded to the power ground and which supplies 14 volts AC to the *ETHER-WAVE*

itself. Plug the round three-pin 'DIN' connector on the adapter cable into the mating power socket on the back side of the *ETHERWAVE*. (That's the side opposite the control panel and the player.) Then plug the adapter itself into a grounded power receptacle, or into a three-wire extension cord which provides a good ground connection. The ground connection stabilizes the *ETHER-WAVE*'s operation.

d) Connecting the amplifier-speaker: The *ETHERWAVE* may be used with a wide variety of musical instrument, stereo, or public address amplifier systems. The nominal level of the *ETHERWAVE*'s audio output is one-half volt RMS and the nominal output impedance is 2.4 Kilohms.

We suggest a small but high-quality portable 'keyboard amplifier' of the sort that synthesizer players frequently use for practicing. Use a shielded audio cable with a conventional 1/4" phone plug on one end, to be plugged into the *ETHERWAVE*'s audio out jack. The other end of the cable should be equipped with whatever kind of plug your sound system requires, and should be plugged into a jack labeled line in, instrument, or aux on your sound system. Do not plug it into a microphone or guitar input, as these inputs are designed for much weaker audio signals.

e) Setting the tuning adjustments: Turn on both the *ETHERWAVE* and your sound system. Set the loudness or volume control on your amplifier about one third of the way up. Touch the pitch antenna of the *ETHERWAVE* and slowly rotate the *ETHERWAVE*'s VOLUME tuning knob clockwise. A high note will be heard. At one setting of the VOLUME tuning knob, the volume will be at a maximum. Starting from this setting, turn the VOLUME tuning knob counterclockwise until the loudness of the tone begins to decrease. Now bring your left hand near the volume antenna. Note that the tone's loudness decreases smoothly, and finally becomes silent when your left hand is two to three inches from the volume antenna. Then remove your left hand from the volume antenna but, still touching the pitch antenna, adjust the volume

control on your sound system so that the tone is as loud as you will want it to be.

Now remove your right hand from the pitch antenna. Turn the *ETHERWAVE*'s PITCH tuning knob fully counterclockwise. You will hear a high pitch. Now *slowly* turn the PITCH tuning knob clockwise. You will hear the tone's pitch go down. When it is about an octave below middle C, step back from the instrument. You should hear the pitch decrease further until the tone stops completely ('zero beat'). Adjust the PITCH tuning knob carefully so that, when your right shoulder is about 24" from the pitch antenna and your right hand is down at your side, the tone's pitch is audible but lower than two octaves below middle C. (Two octaves below middle C is the lowest note on a cello, and slightly below the lowest note on a guitar.)

## **PLAYING THE *ETHERWAVE* THEREMIN**

Pitch and volume of the *ETHERWAVE* sound is controlled by the free movement of the player's hands in the space in the electric fields which surround the two antennas.

Changes in pitch are produced by moving the right hand nearer to or farther away from the pitch antenna. Moving the right hand nearer to the antenna raises the pitch; moving it away lowers it. Changes in volume are produced by moving the left hand nearer to or farther away from the volume antenna. Bringing the hand nearer the antenna weakens the sound; moving the hand away from the antenna strengthens the sound.

Since any moving body will influence the theremin's pitch and volume, it is important that only the player be near the theremin when he is performing. Other people should be at least four to six feet from the pitch antenna. Timbre, or quality of the tone may be varied by changing the settings of the WAVEFORM and

BRIGHTNESS knobs. The WAVEFORM knob adjusts which harmonics are strong and which are weak, while the BRIGHTNESS knob adjusts the overall amount of harmonic content.

Correct Playing Position: Position yourself slightly left of center of the instrument. When your right arm is fully extended, your knuckles should just touch the pitch antenna. The right hand is moved horizontally toward and away from the pitch antenna. The left hand is moved vertically over the volume antenna.

The PITCH and VOLUME tuning adjustments should now be checked. Without moving your feet, place both hands at your side and stand erect. The instrument should produce a very low-pitched tone, or be completely silent ('zero beat'). Now bring your right hand up to your shoulder. The pitch should be about one to two octaves below middle C. If this low note is not heard, then adjust the PITCH knob until the desired condition is obtained. Note that the PITCH knob is a tuning adjustment. It sets the distance that you have to stand away from the pitch antenna in order to obtain zero beat. When you turn the PITCH knob clockwise, the distance is reduced, thus compressing the distance between musical intervals.

Check the volume adjustment as follows: Place your left hand eight inches above the volume antenna. This should produce a noticeable reduction in the loudness of the tone. If it does not, then turn the VOLUME knob counterclockwise until the desired effect is obtained. On the other hand, turning the VOLUME adjustment knob too far counterclockwise will prevent you from producing loud tones. Note that the *ETHERWAVE's* VOLUME knob is a tuning adjustment. Its purpose is to adjust how the instrument's volume changes as your left hand approaches the volume antenna. This knob is not a 'volume control'. That is, it does not simply make the tone louder or softer. It should not be used to set the instrument's maximum volume. The volume control on your sound system is used for that purpose.

You will rapidly develop a feel for these adjustments. After a few practice sessions, you will be able to tune the theremin rapidly and accurately.

Techniques of practicing: Like any expressive musical instrument, the theremin takes some practice. Start with the following simple exercises:

1. Stand slightly left of the center of the instrument, with your right shoulder about 24" from the pitch antenna. Relax your wrists. Think of a note and hum it to yourself. Then move your right hand toward the pitch antenna until the theremin pitch coincides with what you're humming. Now hold the note. This is not as easy as it sounds, but is an important technique to learn. You will find at first that it is actually hard to stand still, but a few hours' practice will work wonders.

2. Hum two different notes, one after the other. Find the first note on the theremin, hold it, and then slowly glide to the second.

3. Repeat the above exercise, but bring your left hand near the volume antenna while your right hand glides from one note to the next. Move the left hand slowly at first, and then more rapidly as you learn to move your left hand independently of your right. This exercise teaches you to 'feel' where the notes are, and to impart expressive dynamics.

4. While playing a note, introduce a vibrato by moving your right hand back and forth from your wrist, several times a second. Concentrate on making the vibrato even and steady.

The above exercises will give you basic skills of theremin playing: finding notes, playing intervals, articulating notes, and introducing a vibrato. With these basic skills, you can play slow melodies. Practicing regular scales and arpeggios will increase your proficiency. Focus on accuracy of pitch and precise control over dynamics.

Once you've mastered the basic moves, it will be time for you to develop your own style. Pay particular attention to shaping envelopes and dynamics with your left hand. Alternate audible gliding from note to note with discrete separation of pitches. Also, avoid producing vibrato continuously. Instead, impart expressive nuance by continuously shaping the amount and rate of vibrato. These considerations are important components of theremin musicianship.

The instructional video *MASTERING THE THEREMIN*, starring theremin virtuoso Lydia Kavina, shows you how to perform these and other exercises. Study this video closely to learn proper theremin-playing technique.

The *ETHERWAVE* theremin is designed to meet the needs of musicians who wish to explore the artistic resources of space control. Your instrument will provide many years of reliable service. Practice it with diligence and you will provide enjoyable music for yourself and your audiences. And finally, give an occasional thought to the spirit of Leon Theremin, to whom we owe so much.

## **MAINTENANCE**

The *ETHERWAVE* theremin requires no routine maintenance. Many years of trouble-free, reliable performance may be expected, if the following common-sense precautions are observed:

1. Never expose the instrument to extremely hot, cold, or damp environments.
2. Don't allow inexperienced people to tamper with the instrument's controls or internal mechanism.
3. Don't drop the instrument, or subject it to excessive vibration.

The *ETHERWAVE* theremin is guaranteed to operate properly for one full year after

purchase, providing the above-listed precautions are observed.

In the event of improper operation, email [techsupport@moogmusic.com](mailto:techsupport@moogmusic.com), call Moog Music's tech support at (828) 251-0090 or (800) 948-1990, or FAX us at (828) 254-6233.

## Etherwave® Plus User's Guide

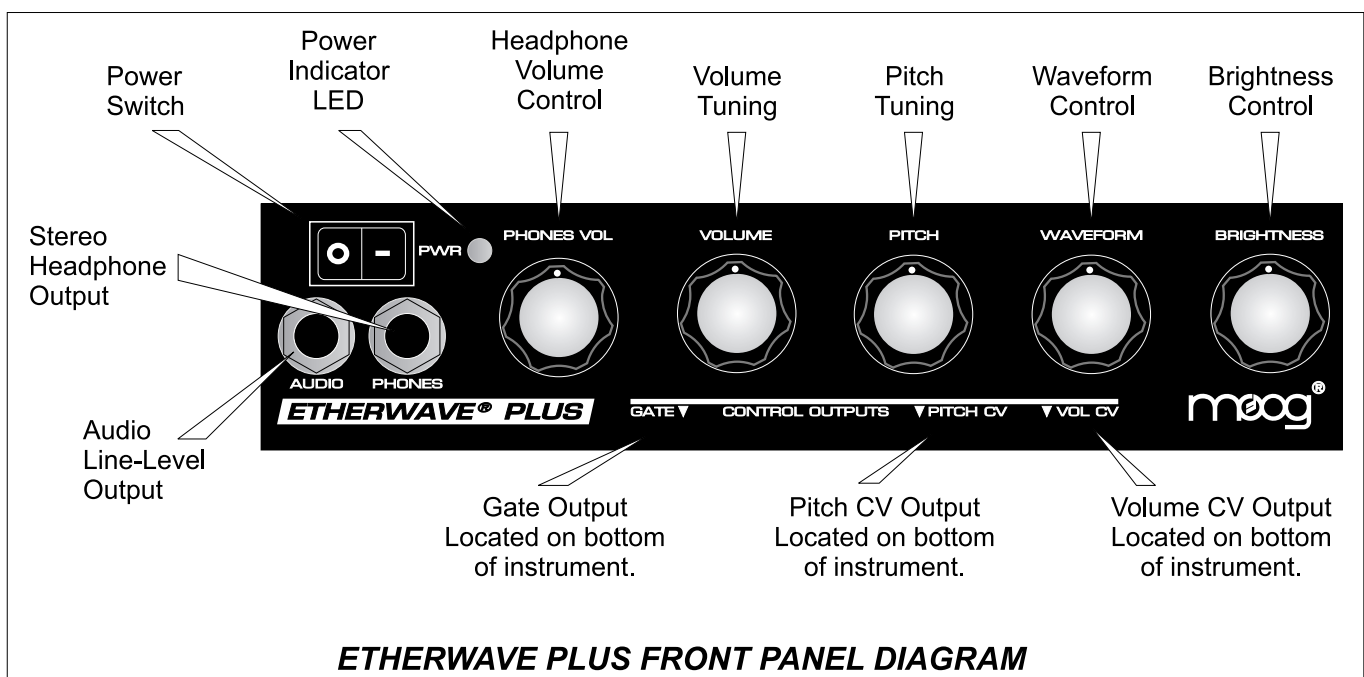
The Etherwave Plus is an expanded version of Moog Music's classic Etherwave theremin, using the same great-sounding and easily playable theremin circuitry that has made the Etherwave our best-selling theremin. The Etherwave Plus adds the following features to the standard Etherwave theremin:

- **Pitch CV output** – The Pitch Antenna can act as a CV (Control Voltage) controller for any external CV compatible device, such as Moogerfooger® Analog effects, the Minimoog Voyager® analog synthesizer, the Little Phatty® analog synthesizer or the Moog Guitar. The Pitch CV is generated from the pitch of the theremin waveform. Nominal output is -2.5V to +4.5V. Zero Volts is output when the theremin produces a pitch one octave below middle C (approx. 131Hz). The Pitch CV output is factory-calibrated to produce a change of 1 Volt per octave change in the theremin's pitch.
- **Volume CV output** – The Volume Antenna can act as a CV controller for any external CV-compatible device. The Volume CV output is generated from the same CV signal used internally for the Etherwave's VCA circuitry. Nominal output is 0 to +10V.
- **Gate Output** – The Gate signal can be used as a signal to start envelopes, trigger sample and hold circuits or other timing related activities. The Gate signal is generated when the Volume CV rises above 0 Volts AND when the theremin audio is greater than 0 Hz. OFF is 0 Volts and +10V is ON.
- **Headphone output with headphone volume control** – can be configured with an internal jumper for normal or "pitch preview" function.
- **Power Indicator LED** - indicates when the unit is on and ready to play.

This User's Guide only describes the added functions of the Etherwave Plus. For information regarding the operation of the Etherwave Plus' basic theremin functions, please refer to the Sections "Setting Up and Playing the Moog Music Etherwave Theremin" in the Etherwave Theremin User's Manual.

### The Etherwave Plus Front Panel

Below is a diagram of the Etherwave Plus Front Panel indicating the Panel Controls and Connections.



## **What is a CV?**

CV stands for Control Voltage. In analog electronic musical instruments, it is a type of low-current electrical signal used to continuously modulate a musical parameter. In the Etherwave theremin, the simplest example of a CV is the control of the instrument's volume by the Volume Antenna. The Volume Antenna circuitry generates a CV that increases as the left hand is pulled away from the antenna. This CV is applied to the control input of a Voltage Controlled Amplifier (VCA). As the voltage generated by the Volume Antenna circuitry increases, the output level of the VCA increases too. We hear this as an increase in volume. For more on the subject, you may wish to refer to the "Basics of Analog Synthesis" chapter of the Minimoog Voyager User's Manual, or the "Basic Theory" section of the CP-25I Control Processor User's Manual, both available on our website: [www.moogmusic.com](http://www.moogmusic.com).

## **What is a Gate?**

A Gate is a signal that has only two levels: Low and High, or sometimes called Off and On. This can be used as a trigger for events, or as a switch type signal. In analog synthesizers, a gate is usually used to start or stop the sound of the instrument by starting and stopping circuits called Envelope Generators. For example, a gate on signal is produced when a key is pressed on the Minimoog Voyager, thus starting a note.

## **Using the Etherwave Plus CV Outputs.**

The Etherwave Plus CV outputs are located on the bottom of the unit as indicated by the front panel, requiring the placement of the Etherwave Plus on a mic stand to provide access. **CAUTION: Be sure you understand the operating levels of the equipment involved before making connections.** Most modern analog equipment has protection built into the inputs of a circuit to prevent damage from unexpected voltage levels. However some equipment may respond in unexpected ways, or may not respond at all to CVs outside the expected levels.

Note that most modern Moog equipment such as moogerfooger analog effects typically specify 0V to +5V or -5V to +5V levels for CV inputs. The Etherwave Plus will work safely with these devices despite outputting voltages greater than specified. In general it is safe to make connections with the equipment powered up.

One thing to avoid when making CV connections is to avoid passively mixing CV output signals into a single CV input, for instance with a "Y" type splitter cable. This can sum the voltages involved and rapidly exceed the voltage levels expected at a CV input. This may cause unwanted results. For combining CV signals, use a CV mixer, such as the 4-input mixer of the moogerfooger CP-25I Control Processor.

## **Example Applications**

*Connecting the Etherwave Plus to a Little Phatty analog synthesizer.*

In this example we will control the Little Phatty so that it can be played in a gestural manner similar to a theremin.

- First, connect the Etherwave Plus Gate Output to the Little Phatty(LP) Gate Input.
- Second, connect the Pitch CV Output to the LP Pitch control input.
- Next, Connect the Volume CV Output to the LP Volume Control Input.
- On the LP, select a preset that is voiced in the 16' range and has a sustaining type envelope.

Now – with your left hand away from the Volume Antenna, Move your right hand closer to the Pitch Antenna – note the LP pitch rises. Now move your left hand close to the Volume Antenna – you will hear the LP go silent – as you lift your left hand away from the Volume Antenna you will hear the LP start a note again.

It is really fun to try different presets out to hear the ways the Little Phatty will respond to the gestural control of the Etherwave Plus!

### *Connecting the Etherwave Plus to a MF-102 Ring Modulator.*

In this example we will control the MF-102's built-in Carrier Oscillator, which is combined with the audio of the theremin itself in the Ring Modulator to produce sum and difference frequencies.

- First, connect the Audio Output of the Etherwave Plus to the Audio Input of the MF-102.
- While making sound with the theremin, adjust the Drive Control of the MF-102 so it is YELLOW.
- Set the MF-102 Frequency Control to 120 Hz (Hi Range).
- Now connect the Pitch CV Output to the MF-102 Frequency Input.
- Set the Mix Control to full CCW and the LFO Amount to full CCW.
- Connect the Volume CV Output to the MF-102 Mix Input.

Now as you move your left hand away from the Volume Antenna, the volume of the audio increases, as does the volume of the ring modulator effect. When your left hand is away from the Volume Antenna, what you hear is 100% the effected signal. As your right hand moves in proximity to the Pitch Antenna you will hear the variation of the difference tones generated by the Ring Modulator as both the pitch of the Carrier Oscillator and the theremin audio are changing. Note: for more information on the operation of the MF-102, refer to "Understanding and Using your MF-102 Ring Modulator" manual, available on our website [www.moogmusic.com](http://www.moogmusic.com).

For an even more intense effect, try the following changes to the previous setup:

- Connect the Volume CV Output to the LFO Rate Input of the MF-102.
- Now set the Mix and LFO Amount to full clockwise.
- Set the LFO Waveform switch to the square wave position.
- Place the LFO Rate Control in mid-position.

Now when your left hand moves away from the Volume Antenna, the LFO Rate increases – even into the audible frequency range. This creates complex sidebands in the Carrier Oscillator itself, generating some very hairy timbres. Far out!

This last example illustrates two important things:

- The Etherwave Plus' antennas don't have to control the same parameter on other pieces of gear that they control on the theremin – for instance the Volume Antenna can control the LFO Rate.
- There are many ways to use gestural control of electronic musical instruments. Hook it up and try it. Experiment!

These are just a couple quick examples to get you started with using the Etherwave Plus as a CV controller. As the variety of modern analog CV-compatible equipment increases, so to does the wealth of opportunities for the use of your Etherwave Plus as an expressive gestural controller for your sonic explorations. For more applications using the Etherwave Plus as a gestural CV Controller, visit our website [www.moogmusic.com/theremin/](http://www.moogmusic.com/theremin/).

### **Configuring the Headphones for "Pitch Preview"**

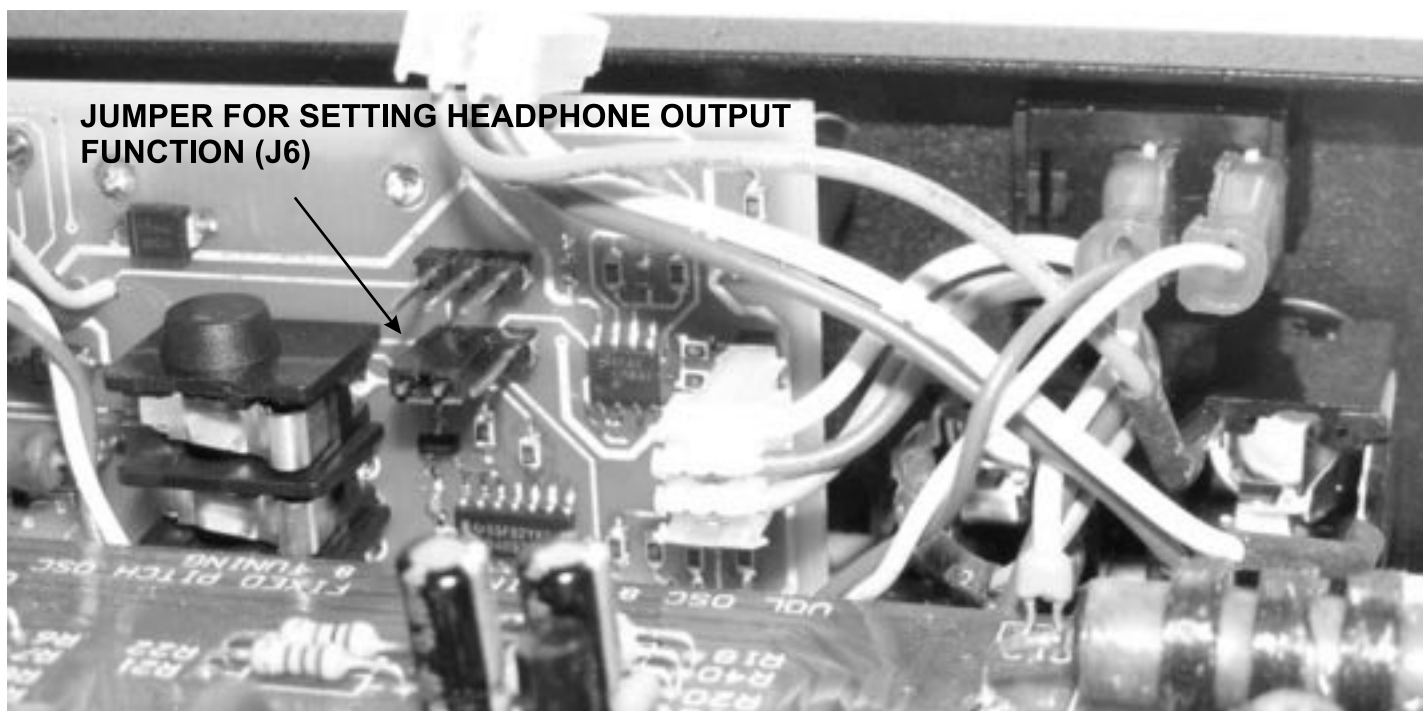
The Headphone Output of the Etherwave Plus is designed to drive a pair of headphones with a minimum of 32 Ohms impedance. The level of the Headphones signal is set by the "Phones Vol." panel control. It is not recommended to use the Headphone Output with a 2-conductor, Tip-sleeve 1/4" instrument plug for an alternate audio output. As configured from the factory, the Headphone Output is generated from the Etherwave Plus' audio output for practicing using headphones.

Some theremin users like to hear the theremin's waveform independently of volume control – the so-called "pitch preview" function. The Headphone Output can be configured for this feature by moving an internal jumper on the Etherwave Plus circuit board.

To change the function of the Headphone Output to pitch preview, follow these steps:

- Disconnect the Etherwave Plus from the power adapter.
- Remove the Etherwave Plus cover.
- Touch a grounded surface to discharge any static electric charge that may be built up on your hands before touching any components inside.
- Looking at the vertically mounted PCB (p/n 11-213) located between the panel and the standard Etherwave theremin PCB (p/n 11-211), find where the Audio Output jack is plugged into the PCB - this connector is labeled J8. Unplug this connection.
- Underneath this connection is a 3-pin connector labeled J6 with a jumper connecting the pin closest to the center of the unit to the middle pin of the connector. Move this jumper to connect the middle pin to the pin closest to the output jacks.
- Now reconnect the Audio Output to the 11-213 PCB, and reinstall the instrument's cover.

The following image shows the location of the jumper:



Now the Headphone Output delivers a pitch preview output to a pair of stereo headphones. With this modification the performer can monitor the current pitch with headphones even when the left hand is shutting off the Audio Output. The performer can then play the desired frequency with the right hand before articulating the note with the left hand. This can be very useful in studio or even live situations where pitch accuracy is required at the onset of the note played.

Specifications subject to change without notice.

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