

# Sine Wave Generator

WA-9867

## Introduction

The Sine Wave Generator supplies adjustable-frequency AC power for applications such as driving speakers, wave drivers, and string vibrators. The digital display and easy-to-use frequency and amplitude controls make this unit ideal for student labs. The additional Auto Play and Advanced Mode features can be used to set up classroom demonstrations and permanent displays that require automated signal variation.

The Sine Wave Generator outputs AC power at up to 10 V amplitude (20 V peak-to-peak) and 1 A of current. The output frequency, adjustable in increments of 0.1 Hz, ranges from 1 Hz to 800 Hz.

**IMPORTANT:** Do NOT connect the output of the Sine Wave Generator to an oscilloscope or other grounded device! Doing so will overload the output and cause the Sine Wave Generator to show only mV outputs. If this happens, you can fix the issue by disconnecting the grounded device and cycling the power on the Sine Wave Generator.

## Equipment

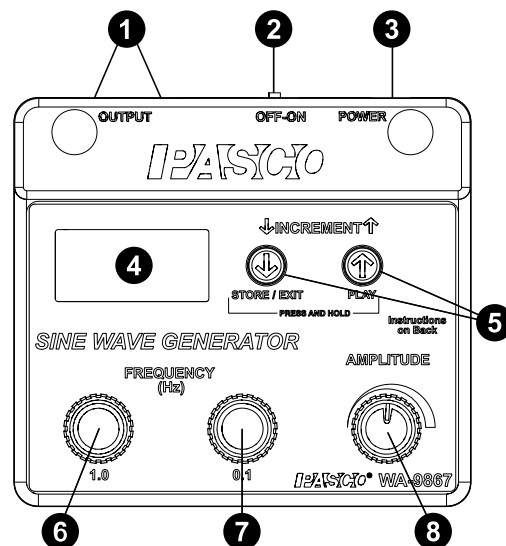
### Included equipment:

- Sine Wave Generator
- Power supply

### Recommended equipment:

- String Vibrator (WA-9857)
- Wave Driver (WA-9855)
- Open Speaker (WA-9900)
- Resonance Air Column (WA-9606)
- Economy Resonance Tube (WA-9495)
- Banana Plug Cord Sets, 30 cm (SE-7123)

## Features



### 1 Output jacks

Use to connect the Sine Wave Generator to a device to be driven.

### 2 OFF-ON switch

Slide to the right to turn the device on. Slide back to the left to turn the device off.

### 3 Power input

Use to connect the power supply to the Sine Wave Generator.

### 4 Display

Indicates the frequency value which is currently being output or selected. In Auto Play mode, the display will also switch to briefly show the time duration of each frequency when a frequency knob is turned.

### 5 Increment buttons

Use to increase or decrease the output frequency by a specific stored increment, as well as to switch between and control various modes.

### 6 Coarse (1.0) Frequency knob

Turn by one click to adjust the value on the display by a specific amount.

### 7 Fine (0.1) Frequency knob


Turn by one click to adjust the value on the display by one tenth the amount of a single click of the Coarse knob.

### 8 Amplitude knob

Turn to adjust the amplitude of the output signal.

## Setup and basic use

1. Connect the included power supply to the power input of the Sine Wave Generator, then plug the power supply into a standard wall outlet. Slide the **OFF-ON** switch to the right to turn on the device.
2. Using a pair of 4 mm banana plug patch cords, connect a device such as a speaker or string vibrator to the Sine Wave Generator's output jacks.
3. Turn the Amplitude knob to adjust the amplitude of the output signal. The device can produce signals with amplitudes ranging from approximately 0 V to 10 V.
4. Turn the Coarse and Fine Frequency knobs, labeled "1.0" and "0.1" respectively, to adjust the output frequency. Each click of the Fine Frequency knob changes the frequency by 0.1 Hz. Each click of the Coarse Frequency knob changes the frequency by 1.0 Hz if turned slowly, or by 4.0 Hz if turned quickly.

 **NOTE:** If desired, you can use the built-in clamp on the back of the Sine Wave Generator to mount the device on a vertical rod, as shown below.




## Increment function

### Manual

You can change frequency value by a specified increment using the **Up** and **Down** arrow buttons. By default, this increment is 100 Hz.

To change the value of the stored increment:

1. Using the Frequency knobs, adjust the output frequency to the value you would like to set as the increment.
2. Press and *hold* the **Down** arrow button. After one second, the display will blink to indicate that the increment has been changed to the selected value.
3. You can now press the Up or Down arrow buttons to increase or decrease the frequency by the new increment.


 **NOTE:** The stored increment resets to 100 Hz each time the Sine Wave Generator is turned off.

### Auto Play

The increment is also used in the Auto Play mode. In this mode, the Sine Wave Generator will automatically increase the frequency by the stored increment, repeating this action until it reaches the 800 Hz frequency limit and wraps around. To activate Auto Play mode:

1. Set the increment to the desired value, as described above.
2. Change the output frequency to the desired starting frequency.
3. Press and *hold* the **Up** arrow button for about one second. The display will blink briefly to indicate that Auto Play has begun.

4. By default, the frequency changes every 1.5 seconds. To change the duration, turn the frequency knobs. Each click of the Coarse Frequency knob changes the duration by 1.0 seconds, while each click of the Fine Frequency knob changes it by 0.1 seconds.

 **NOTE:** All frequencies in Auto Play mode will always have equal duration. You cannot change the duration of only certain frequencies.


5. By default, the sequence starts over upon reaching the highest possible value before 800 Hz. To change the highest value, press and hold the **Up** button while the highest frequency you wish to include is playing.
6. To exit Auto Play mode and return to normal operation, press and hold the **Down** arrow button until the display blinks.

## Advanced Mode

Advanced Mode allows you to set, store, and play back a sequence of up to 80 frequencies. The Sine Wave Generator will record the frequency and amplitude of each stored frequency. This mode is especially useful when demonstrating resonance in vibrating strings, as it allows you to set the optimal amplitude and frequency for each harmonic.

Follow these steps to enter Advanced Mode, record a sequence of frequencies, and play back those frequencies:

1. Connect the Sine Wave Generator's output to an appropriate apparatus, such as a String Vibrator (WA-9857) with a string, so you can tune the frequency and amplitude.
2. Press and *hold* both arrow buttons simultaneously to enter Advanced Mode. The display will change indicate the number of recorded frequencies stored in the device's memory.
3. Press and hold both arrow buttons again to clear the saved sequence and begin recording new frequencies. The display will briefly show 0 and then begin to flicker.
4. Set the frequency and amplitude of the first frequency in the sequence using the Frequency and Amplitude knobs.

 **NOTE:** Check your entries carefully! Once a frequency has been stored, it cannot be further edited, changed, or erased other than by clearing and re-entering the entire sequence.

5. Press and *hold* the Down arrow button until the display changes. The frequency you entered will be stored, and the display will momentarily show the number of stored frequencies and then return to displaying the frequency value.
6. Repeat Steps 4 and 5 for each frequency in the desired sequence.
7. Once you have stored all frequencies, press and hold the **Up** arrow button until the display stops flickering. The Sine Wave Generator will automatically begin playing the stored sequence on repeat.
8. While a sequence of frequencies is being played back, you can control the playback in a variety of ways:
  - Turn the Amplitude knob to increase or decrease the amplitude of the entire sequence by a specific proportion.
  - Turn the Frequency knobs to change the duration of all frequencies in the sequence by the same amount.

- Press the Down arrow button to pause the sequence. While the sequence is paused, press the Up or Down arrow buttons to switch to the next or previous frequency in the sequence. You can also turn the Frequency knobs to vary the output frequency. (This does NOT change the actual stored frequency.) To unpause, press and *hold* the Up arrow button.
  - Press the Up arrow button to restart the sequence.
9. Press and *hold* the Down arrow button to exit Advanced Mode and return to normal operation. The sequence of frequencies remains stored in the Sine Wave Generator's memory, even if the device is turned off and disconnected from power.

## Applications

### Open resonance tube

One common application for the Sine Wave Generator is to connect the device to a speaker at one end of a tube that is open at both ends. By properly setting the increment and starting frequency, you can use Auto Play to make the Sine Wave Generator step through the resonance frequencies of the tube. Alternatively, by setting a very small increment, you can program the Auto Play to slowly sweep through a specific frequency range, allowing you to identify the fundamental frequency.

### Closed resonance tube

The tube resonance experiment described above can also be performed with a tube that is closed at the end opposite the speaker. In this case, automatically playing through the resonance frequencies with Auto Play will cause the even-numbered resonant frequencies to be inaudible due to the properties of such tubes. You can also double the increment to demonstrate that all odd-numbered resonant frequencies are audible.

### Vibrating string

You can also use the Sine Wave Generator with the String Vibrator (WA-9857) to demonstrate resonance frequencies visually. Drive the string with the Sine Wave Generator, then use Advanced Mode to create a sequence of frequencies at the string's first several harmonics. When the sequence is played, you will observe the string vibrating with one segment, two segments, three segments, and so on.

## Storage

The recessed dimples on the top of the case align with the rounded feet on the bottom of the case. This allows several units to be easily stacked for storage.

## Specifications and accessories

Visit the product page at [pasco.com/product/WA-9867](https://www.pasco.com/product/WA-9867) to view the specifications and explore accessories. You can also download experiment files and support documents from the product page.

## Technical support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

-  Chat [pasco.com](https://www.pasco.com)
-  Phone 1-800-772-8700 x1004 (USA)  
+1 916 462 8384 (outside USA)
-  Email [support@pasco.com](mailto:support@pasco.com)

### Limited warranty

For a description of the product warranty, see the Warranty and Returns page at [www.pasco.com/legal](https://www.pasco.com/legal).

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### Product end-of-life disposal



This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle or disposal service, or the place where you purchased the product. The European Union WEEE (Waste Electronic and Electrical Equipment) symbol on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

### CE statement

This device has been tested and found to comply with the essential requirements and other relevant provisions of the applicable EU Directives.

### FCC statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.