

Mini Digital Signal Generator User's Manual

**Version 1.10
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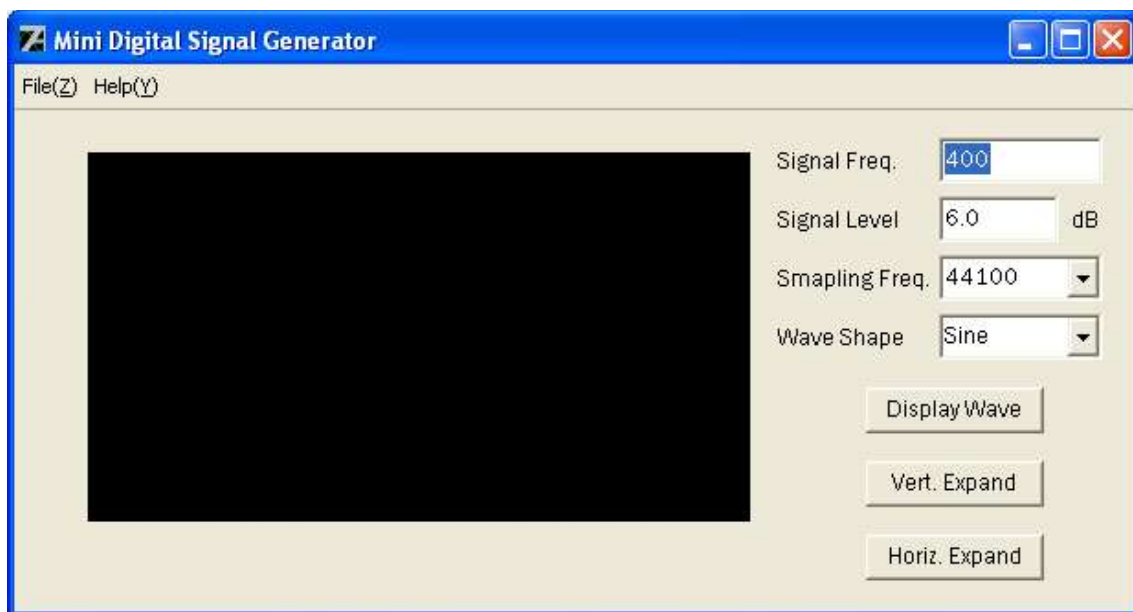
TA Signal Processings Inc.

1. Introduction

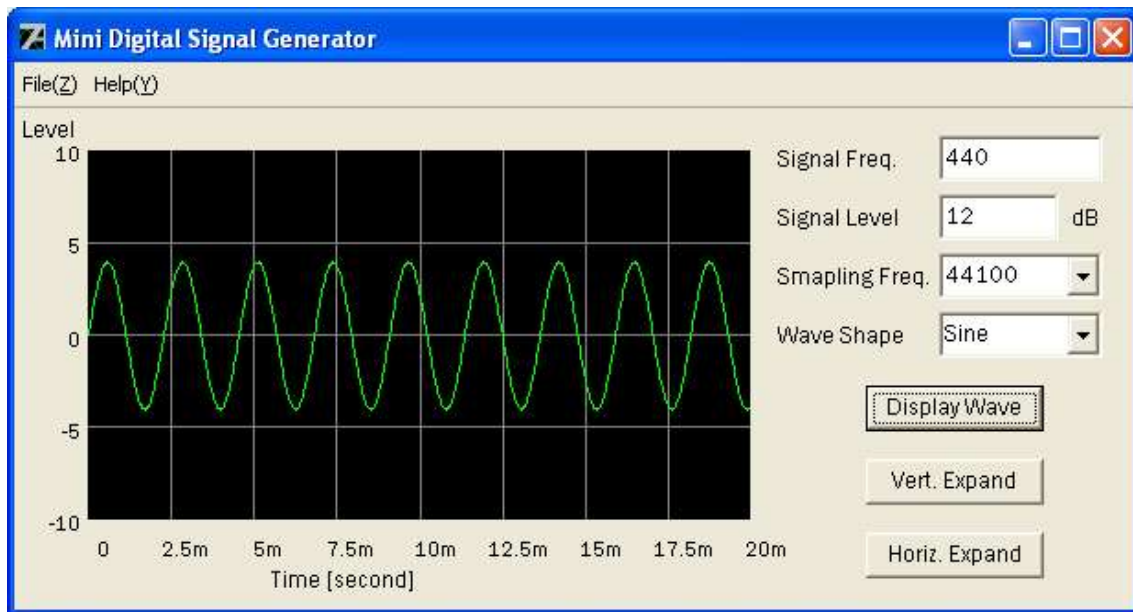
Thank you for using Mini Digital Signal Generator (Mini DSG). Mini DSG is a tool to generate RIFF format WAV s including reference signals. You can easily create a WAV including a wave with desired frequency and amplitude since you can visually confirm the wave on a screen before saving to the file. Please read and understand this manual before utilizing Mini DSG .

2. Getting Started

I will briefly explain how to use Mini DSG by assuming to make a 440Hz sine wave with 20 seconds length as an example. As you click the icon for Mini DSG on your desktop, the following window appears.

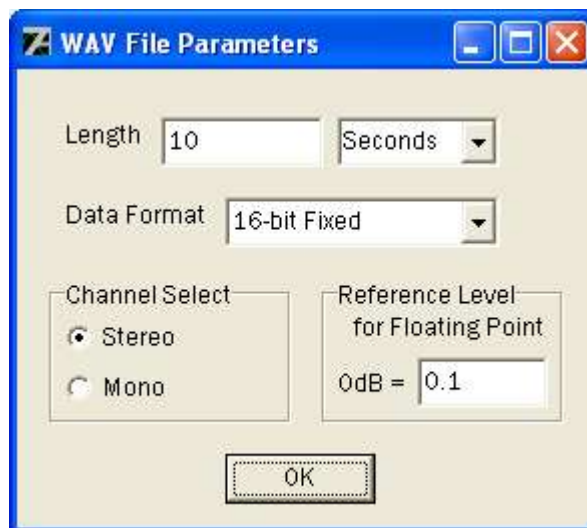


Here, you put 440[Hz] on the “Signal Freq.” field and a value of the signal amplitude on the “Signal Level” field. Here, you can use 12[dB], which is 40% of the full scale since zero[dB] is defined as one-tenth of the full scale. As the sampling frequency depends on the purpose of the WAV created, we choose 44.1KHz just same as music CDs which is commonly enough for general purpose. So you put 44100 on the “Sampling Freq.” field. You select “Sine” from “Wave Shape” field to choose a sine wave. Here, you click “Display” button to display the waveform on the screen. It appears on the screen as the vertical scale is fixed corresponding to the full scale and the horizontal scale is automatically adjusted in order that several periods are included in the screen.



To expand the wave, you can click the “Vert. Expand” button vertically and “Horiz. Expand” horizontally. When you click the “Vert. Expand” button, the wave is expand so that the peak-to-peak fits 80% of the full screen. When you click the “Horiz. Expand” button, the wave is expand so that only a wave fits the full screen.

You can save the wave to a file after confirming the wave on the screen. To save to a file, select “Save To” from the “File” pull-down menu on the menu bar. You can see “WAV Parameters” window appearing, where you specify the saved data length and number of channels.



Since the time to be saved is 20 seconds, put 20 on “Length” field and select “Second” in the following field. Select “Mono” in the “Channel Select” in order to save the length. (If you choose the Stereo, the sound appearing at the speakers are same because an exactly same wave is saved in both channels.) Keep the “Data Format” as “16-bit Fixed.” When you click the “OK” button here,

the “Save As” dialog appears and you can specify your name on it. As you click the “Save” button in the dialog, a progress bar appears. It stays during the data is saving to the file and the saving completes within several seconds. (it may be longer depending on your machine.) After closing by selecting “->Exit” on the main menu bar or clicking “Exit” button located on the upper-right of the window, check the WAV by using a WAV player such as Windows Media Player.

3. Making and Displaying a Signal

You can visually confirm the wave you are saving to on the screen located in the main panel before you save it to a . To display the wave, you need to specify the signal frequency, the amplitude, the sampling frequency and the wave-shape before displaying.

3-1. Specifying the Signal Frequency

To specify the signal frequency, put a desired signal frequency in Hz on the “Signal Freq.” field. You can use a number with a fraction since the number are internally converted to a 64-bit floating point number. The minimum frequency here is 1.0Hz and you cannot use the half of the sampling frequency or more. When the signal frequency is relatively high, you may see some distortion but it is natural since the numbers of samples assigned to a period is too few to represent the wave specified.

3-2. Specifying the Signal Amplitude

To specify the signal amplitude, put a desired signal amplitude in decibel on “Signal Level” field. As one-tenth of the full swing is defined as 0dB when a fixed point format is used, the output level is one-tenth of the full swing if you set 0dB and the output reaches the full swing if you set +20dB. The maximum signal level is +20dB and the minimum is -60dB. When a floating format is used, you can specify a reference level corresponding to the zero decibel.

When the wave shape is not a sine wave, the magnitude of pulses corresponding to 0dB is one-tenth of the half swing in the PCM formats or the reference level in the floating point formats.

3-3. Selecting a Sampling Frequency

You can select a sampling frequency in the “Sampling Freq.” field. Frequencies you can select are the following.

- 8000Hz (8KHz)
- 11025Hz (11.025KHz)
- 22050Hz (22.05KHz)
- 44100Hz (44.1KHz)
- 48000Hz (48KHz)

3-4. Selecting a Waveshape

You can select a waveshape in the “Waveshape.” field. Waveshapes you can select are the following.

- Sine

A sine wave is generated.

- Step [0,1]

A rectangular wave consisting of 0 and 1 is generated. This waveshape is useful for testing step responses of filters.

- Step [0,-1]

A rectangular wave consisting of 0 and -1 is generated. This waveshape is useful for testing step responses of filters.

- Step [-1,1]

A rectangular wave consisting of -1 and 1 is generated. Since this is a rectangular wave represented by a discrete signal, aliasing distortions will inherently occur. Please note that if you use this waveshape.

- Pulse [0,1]

A series of positive pulse is generated. This waveshape is suitable for testing impulse responses of filters.

- Pulse [0,-1]

A series of negative pulse is generated. This waveshape is suitable for testing impulse responses of filters.

3-5. Display and Magnifying a Wave

3-5-1. Display a wave

To display a wave, click the “Wave Display” button. As the button is clicked, parameters specifying the output wave are read. If the application found an error such as signal frequency is more than the half of the sampling frequency, a pop-up window appears to indicate the error. If no error was found, specified signal wave is display on the screen. It appears on the screen as the vertical scale is fixed corresponding to the full scale and the horizontal scale is automatically adjusted in order that several periods are included in the screen.

3-5-2. Vertically magnifying the wave

To vertically magnify the wave, click the “Vert. Expand” button. As the button clicked, the wave is vertically magnified to 80% of fill scale and the name of the button changes to “Vert. Resume”. (If the wave displayed already exceed 80% of the full scale, the displayed wave is not affected.) Clicking the “Vert. Resume” button resumes the wave.

3-5-3. Horizontally magnifying the wave

To horizontally magnify the wave, click the “Horiz. Expand” button. As the button is clicked, the wave is horizontally magnified as a period is just included in the horizontal span and the name of the button changes to “Horiz. Resume”. Clicking the “Horiz. Resume” button resumes the wave.

3-5-4. Updating the displayed wave

To display a wave with updated parameters, click the “Wave Display” button after modifying the parameter field. If the wave is vertically or horizontally magnified, the scale resumes to the original when the “Display Wave” button is clicked. This happens even if no parameter is changed so you can click the “Display Wave” instead of both the “Vert. Resume” and the “Horiz. Resume” to resume the wave.

4. Saving to a File

To save the displayed wave on the screen, select “Save To” from the “” pull-down menu on the menu bar. As “Save To” is selected, the “WAV Parameters” window appears.

4-1. WAV Parameters Window

You can specify parameters relating to the wave saved in the “WAV Parameter” window. As you click the “OK” button after specifying the parameters, the “Open” dialog appears. Since the “WAV Parameter” window does not have a cancel button, click the “Cancel” on the dialog window if you want to cancel saving to a file.

4-1-1. Specifying the Length

You can specify the length of the digital signal saved in the “Length” field on the “WAV Parameter” window. The length of digital signal can be specified in seconds or the number of samples. You can choose either by selecting “Seconds” or “Samples” in the list following the “Length” field. When you choose “Samples,” samples of each channel are not separately counted. So, if you save a signal of ten seconds length with 44.1KHz sampling frequency, the number of samples to be specified is $44100 \times 10 = 441000$ whether the number of channels is one or two.

4-1-2. Specifying the Number of Channels

The number of channels to be saved can be specified by “Channel Select” buttons on the “WAV Parameters.” When “Stereo” is selected, each channel in the saved wave is exactly the same.

4-1-3. Specifying the data format

To specify the data format in the file, select a format from “Data Format” field.

8-bit Fixed
16-bit Fixed
24-bit Fixed(Ex)
32-bit Fixed(Ex)
32-bit Floating(Ex)
64-bit Floating(Ex)

The “Ex” in above means that the EXTENSIBLE format is used. Windows Media Player for Windows XP 8.00 supports up to 32-bit Floating. Note that some sound cards or software do not support the EXTENSIBLE format.

4-1-4. Specifying the reference level for floating formats

To set the reference level, put a desirable value for 0dB on the “Reference Level for Floating Point” field. The value makes no effect when a fixed point format is selected. The field is disabled when a fixed point format is selected.

4-4. Specifying the Name

As you click the “OK” button on the “WAV Parameters” window, the “Save As” dialog implemented in Windows appears. Since the extension “.wav” is automatically added, you need not to put the extension unless you use an extension other than “.wav”. Clicking the “Save” button starts storing to the .

4-5. Storing to the

As storing to a starts by clicking the “Save” button, “Storing to a WAV ” window appears. A progress bar on the window shows the progress of storing. If you want to cancel storing, click the “Cancel” button. As a confirmation window appears, you can click “Yes” if you really want to cancel storing or you can click “No” if you want to continue storing.

5. Error Messages

Error messages you may see in this application are the following.

Parameter Error: Only a valid value can be accepted

The error message appears if an invalid value or no value is in a field in which a valid value is required. When a value with a fraction is in a field which accepts only an integer number, this message will appear.

Parameter Error: Signal Freq. should be 1.0Hz or more.

When the sampling frequency specified is less than 1.0Hz, this message will appear.

Parameter Error: Signal Freq. should be less than the half of the sampling frequency

When the signal frequency specified is the half of the sampling frequency or more, this message will appear.

Parameter Error: -60dB or less is too small for 16-bit PCM.

When the signal level specified is less than -60dB, the output signal stored with a fixed point format will have only zeros or very little values.

Parameter Error: More than +20dB will make clipped signal in PCM formats.

When the signal level specified is more than +20dB , the output signal stored with a fixed point format will exceed the limits and be clipped.

Parameter Error: The data length should be 1.0 to 1000.0 seconds

When the length specified is out of range defined by the specification of this application, this message will appear.

Warning: Parameters used in displaying the wave will be used in saving the wave to a instead of current parameters.

When you select “Save to ” before displaying the after updating parameters specifying the wave, this message will appear. If you continue saving to a , the application use the parameter when you display at the latest instead updated values on the field to generate a wave stored to a . If you want to cancel, close the message window, click the “OK” button in the “WAV Parameters” window to open “ dialog window” and click the “Cancel” button.

6. Specifications

6-1. Output Wave

6-1-1. Output Frequency

Minimum Frequency: 1.0Hz

Maximum Frequency: not exceeding the half of the sampling frequency

Resolution: Same as the double precision (64bit) floating point

6-1-2. Output Level

Minimum Level: -60dB

Maximum Level: +20dB

Resolution: Same as the double precision (64bit) floating point

6-1-3. Output waveshape

- Sine Wave
- Step (Positive, Negative, Bidirectional)
- Pulse (Positive, Negative)

6-2. WAVE File

6-2-1. Supported File Formats

- 8-bit Fixed: WAVE PCM unsigned 8-bit uint
- 16-bit Fixed: WAVE PCM int 16-bit
- 24-bit Fixed: WAVE EXTENSIBLE PCM int 24-bit
- 32-bit Fixed: WAVE EXTENSIBLE PCM int 32-bit
- 32-bit Floating: WAVE EXTENSIBLE IEEE Floating 32-bit
- 64-bit Floating: WAVE EXTENSIBLE IEEE Floating 64-bit

6-2-2. Sampling Frequency

- 8000Hz (8KHz)
- 11025Hz (11.025KHz)
- 22050Hz (22.05KHz)
- 44100Hz (44.1KHz)
- 48000Hz (48KHz)

6-2-3. Number of Channels

1 (Monaural) or 2 (Stereo)

6-2-4. Saved Data Length

1.0 to 1000.0 seconds