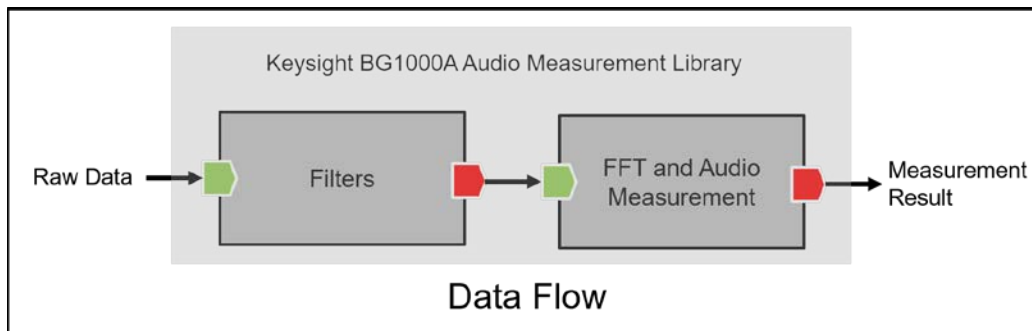


# BG1000A Audio Measurement Library

## Overview

The Keysight Technologies, Inc. BG1000A Audio Measurement Library provides powerful audio analysis functions for software developers. It allows users to perform complex audio measurements using data captured from Audio Analyzer, Digitizer and other hardware. It enables fast and easy software development of any applications which require audio analysis.



## Applications

From early R&D development, design validation to manufacturing test automation of radio and mobile devices, automotive and consumer electronics.

- Audio testing of tactical and public safety radios in commercial and military applications.
- Audio performance testing of mobile phone/devices in production test application.
- Audio analysis of automotive infotainment system.
- Audio quality evaluation of consumer audio/visual devices (TV, Home theater, Power Amplifier etc.).
- Any applications which require audio analysis.

## Key Benefit

- Easily implement complex audio measurements by just calling the measurement functions included in the BG1000A Audio Measurement Library without the need to worry about the computation details.
- This audio measurement library is not tightly coupled with any hardware. The library should be able to be used by any party that need this measurement functions
- Shorten the development time and get quality results sooner.
- Multiple SINAD acquisitions from a single command allow custom averaging algorithm application for sensitivity measurements.
- Supporting various software development environment such as Visual C#, Visual C++, Keysight VEE, Labview.

## Key Features

### FFT for frequency domain analysis

- Fast-Fourier Transform (FFT analysis) with selectable windowing options.
- Selectable windows are Hanning, Blackman Harris, Hamming, Flattop and Kaiser windows

### Audio measurement functions

- DC level measurement.
- AC RMS level measurement.
- Peak-to-peak voltage measurement.
- Frequency measurement.
- Phase measurement.
- Signal-to-Noise And Distortion ratio (SINAD) measurement.
- Total Harmonic Distortion and Noise (THD+N) ratio and level measurement.
- Total Harmonic Distortion (THD) ratio and level measurement.
- Harmonic analysis.
- SMPTE Inter-Modulation Distortion(SMPTE-IMD) measurement.
- Difference Tone Distortion(DFD) measurement: DFD60268 2nd order; DFD60268 3rd order; DFD60118 2nd order and DFD60118 3rd order.
- Crosstalk/Channel Isolation measurement.
- Input signal DC component removal function.
- List mode measurement: this feature takes multiple measurement readings from a single command. The number of reading is specified, and the reading will be taken as fast as possible. The applicable measurements are SINAD, THD, THD+N and AC/DC Level.

### Audio filters

- Low pass filters (LPF): 3kHz, 15kHz and 20kHz.
- High pass filters (HPF): 20Hz and 400Hz.
- Weighting filters: A-weighted, CCIR1k weighted, CCIR2k weighted, CCITT weighted and C-Message weighted filters.

## Peak and valley search

- Peak and valley search: find all peaks and valleys in a list, with a user defined minimum distance and magnitude threshold.
- Peak measurements: peak magnitude and peak width

## Example Use Models: Using Keysight Audio Measurement Library

### Use Case 1: Using Keysight BG1000A Audio Measurement Library as standalone software

Examples below shows you how to setup a C# project in Visual Studio before you proceed to use the BG1000A Audio Measurement Library.

#### Step 1. Create a proper reference to the audio measurement library DLL in order to access the library classes

1. Open a Visual C# project from Microsoft Visual Studio.
2. Add the Keysight.AudioMeasurementLibrary.dll file located the below path as your project reference.
  - For 64-bit application, the .dll file is located at C:\Program Files\Keysight\Keysight Audio Measurement Library folder.
  - For 32-bit application, the .dll file is located at C:\Program Files(x86)\Keysight\Keysight Audio Measurement Library folder.

#### Step 2. Include FloLicenseProvide.dll into the project

You need to include the FloLicenseProvider.dll file into your project output directory in order for the audio measurement library to work properly. The FloLicenseProvider.dll file is located at the below path:

1. For 64-bit application, the .dll file is located at C:\Program Files\Keysight\Keysight Audio Measurement Library folder.
2. For 32-bit application, the .dll file is located at C:\Program Files(x86)\Keysight\Keysight Audio Measurement Library folder.

#### Step 3. Add Namespace in Project Source File

Add the following namespace in your project source file to call the APIs in the library.

```
using Keysight.BG1000A;
```

**Note:** You do not need to instantiate the audio measurement library. All methods are static. You can access the method directly using the class name. For example, calling the MeasureFrequency method.

```
ushort status = AudioMeasLib.MeasureFrequency(192000, 32768, 1, inputData, out meas);
```

## Use Case 2: Using Measurement Functions in M9260 IVI driver

M9260A PXI Audio Analyzer is designed for performance audio measurement in a PXI system. The M9260 has built-in IVI command interface that utilize the Keysight BG1000A Audio Measurement Library. For user who has M9260A hardware can use its IVI command interface to make measurements.

Examples below shows you how to setup a C# project in Visual Studio before you proceed to use the M9260 IVI COM driver to do measurements.

### Step 1. Referencing the Driver

1. Open a Visual C# project from Microsoft Visual Studio.
2. Add the following libraries from the COM tab from the Add Reference menu.
  - IviDriver 1.0 Type Library
  - IVI KtM9260 1.1 Type Library

### Step 2. Add Namespace in Project Source File

Add the following namespace in your project source file to call the APIs in the library.

```
using Keysight.KtM9260.Interop;
```

### Step 3. Create an Instance of the Driver and Initialize the Driver

Create instance of the driver

```
KtM9260 driver = new KtM9260();
```

Initialize the driver. Calling Initialize will establish an I/O connection. Close need to be called at the end of your program.

```
driver.Initialize("PXI15::0::0::INSTR", false, false, "");
```

### Step 4. Calling the Measurement Functions.

After the driver initialization, you can now access to the driver properties and methods.

Example below shows how to call the MeasureFrequency function.

```
string anachannel1RepCapName = driver.AnalogAnalyzer.Channels.Name[1];
```

```
IKtM9260AnalogAnalyzerChannel2 analyzerChannel1 =  
driver.AnalogAnalyzer2.Channels2.Item2[anachannel1RepCapName];
```

```

double[] Measurements = new double[1];

analyzerChannel1.Measurement2.MeasureFrequency(1,

    KtM9260LPFEnum.KtM9260LPFNone,

    KtM9260HPFEnum.KtM9260HPF20Hz,

    KtM9260WeightingEnum.KtM9260WeightingNone,

    KtM9260DeEmphasisEnum.KtM9260DeEmphasisNone,

    false,

    2000, ref Measurements);

```

## Configuration and Ordering Information

### License

Keysight BG1000A Audio Measurement Library is licensed based. Licenses are sold as node-locked, floating, transportable and USB Portable, and reside on the PC or embedded controller.

### Supported hardware

The BG1000A audio measurement library is not attached to any specific hardware. It can be used by any applicable hardware, for example: Audio Analyzer module, DSA module or digitizer module for audio measurement. Below is an example Keysight hardware which are supported by BG1000A.

- Keysight M9260A PXI Audio Analyzer module.

### Ordering information

Keysight BG1000A Audio Measurement Library can be ordered by different license term and license type:

Options	R Number	Description
BG1000A-1FL	R-X4R-001-L	Keysight Audio Measurement Library, node-locked, 12 months license
BG1000A-1FP	R-X5R-001-A	Keysight Audio Measurement Library, node-locked, perpetual license
	R-X6R-001-L	Add 12-months, node-locked, software support subscription
BG1000A-1NL	R-X4R-002-L	Keysight Audio Measurement Library, floating, 12 months license
BG1000A-1NP	R-X5R-002-B	Keysight Audio Measurement Library, floating (single site), perpetual license
	R-X6R-002-L	Add 12-months, floating (single site), software support subscription
BG1000A-1TL	R-X4R-004-L	Keysight Audio Measurement Library, transportable, 12 months license
BG1000A-1TP	R-X5R-004-D	Keysight Audio Measurement Library, transportable, perpetual license
	R-X6R-004-L	Add 12-months, transportable, software support subscription
BG1000A-1UL	R-X4R-005-L	Keysight Audio Measurement Library, USB portable, 12 months license
BG1000A-1UP	R-X5R-005-E	Keysight Audio Measurement Library, USB portable, perpetual license
	R-X6R-005-L	Add 12-months, USB portable, software support subscription

## Related hardware

Keysight M9260A PXI Audio Analyzer

[www.keysight.com/find/M9260A](http://www.keysight.com/find/M9260A)

The example program for M9260A can be obtained when the user downloaded the IVI driver for M9260A

## Conclusion

The Keysight Technologies, Inc. BG1000A Audio Measurement Library is a powerful tool for those software developers who are not familiar with audio measurement. BG1000 includes all audio measurement functions. Users just simply call the measurement function and measurement result will be get without worry about complex audio measurement computation.

It allows users to perform complex audio measurements using data captured from Audio Analyzer, Digitizer and other hardware. BG1000A is not tightly coupled with any hardware. The library should be able to be used by any party that need this measurement functions

Learn more at: [www.keysight.com](http://www.keysight.com)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

